

OVER 50 MODIFIED MOTORS DYNO TESTED!

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# car action

THE WORLD'S BEST-SELLING R/C CAR MAGAZINE

# JUMP!

WE SHOW YOU HOW TO GET HIGHER  
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Don't miss the 33-foot jump—pg. 104

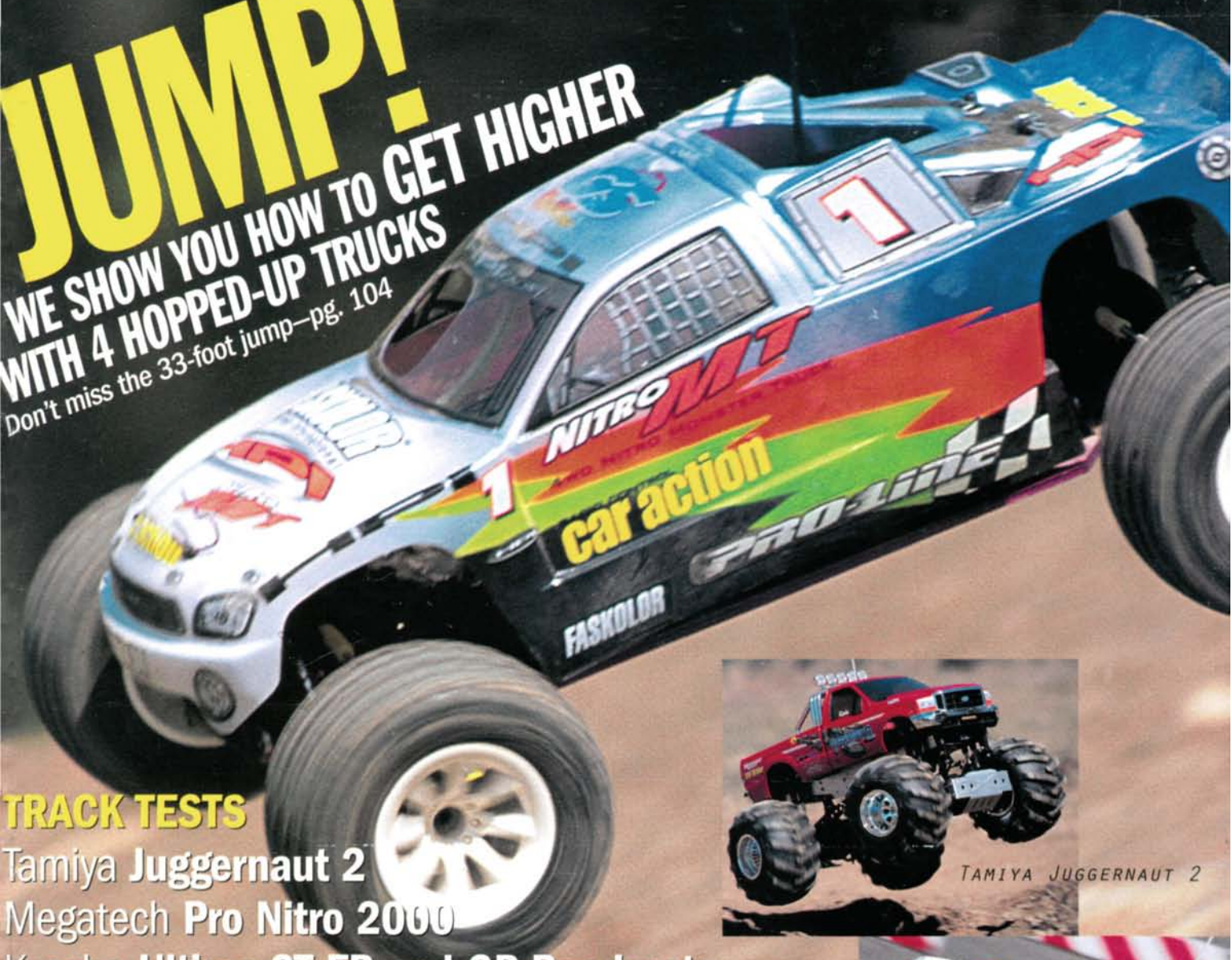
## TRACK TESTS

Tamiya Juggernaut 2  
Megatech Pro Nitro 2000  
Kyosho Ultima ST EP and GP Readysets  
Tamiya TB01

## CAR OF THE YEAR

HOW TO Rewire your ESC

TECH INSIGHT The Technology of Tuned Pipes



TAMIYA JUGGERNAUT 2



KYOSHO ULTIMA ST EP AND GP



MEGATECH PRO NITRO 2000



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2000

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08 >



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by the staff of RC Car Action

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**Give your speedo a new lease on life!**

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**ON THE COVER** (clockwise from top): Trinity Speed Gems modified motor—just one of over 50 we dyno tested! Our "Project" HPI Nitro MT, about to touch down from a low-orbital hop; the Tamiya Juggernaut II on the way up; Megatech's Pro Nitro 2000 takes off; and the Kyosho Readysset Ultima trucks go wheel to wheel. Walter Sidas was behind the camera for all the action.

## track tests



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by Doug Huse



**When I was kid—or, more precisely, a younger kid—I used to jump my toy Evel Knievel motorcycle over Evel's "stunt van." Now it's a full-size station wagon and an 1/8-scale buggy, but the fun is the same. Never grow up.**

**Peter Vieira**  
Executive editor

**Chairman of the Board** ALDO DEFRANCESCO  
**President and CEO** LOUIS DEFRANCESCO JR.  
**Senior Vice President** YVONNE M. DEFRANCESCO

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## Put the Pedals to the Metal

In the December 1999 issue of *RCCA*, in the article about the history of RC cars, one of the pictures in it really caught my eye. It showed a couple of people starting a nitro car with a bike tire! Is this possible with current nitro cars? Would it work with the Nitro RS4 RTR? If so, how? This would be a lot cheaper than buying a starter box and easier than a pull-starter. [email]

ANDY NELSON

Sorry, Andy; the bicycle rig won't work with today's cars, although the principle of a starter box is the same. The guys in that ancient picture are actually starting the car by using the bike wheel to spin the car wheel; it works because the car is direct-drive without a clutch. —Pete

## Long-Distance Nitro 4-TEC

I decided to buy a Traxxas Nitro 4-TEC, and I'll buy the RTR version with the TQ radio. I visited the Traxxas website, which said the TQ radio has a 1/4-mile radio range. If I brought my Nitro 4-TEC to my school's running track (which is a 1/4-mile oval) and stood in the middle of the infield, could I drive the Nitro 4-TEC around the track without losing radio range? [email]

MIKE OSTEN

I think you'd lose the car because of radio trouble or an inability to see it well. The TQ allows you to drive your car out of sight if you're in a wide-open space without power lines, chain-link fences, parked cars, light poles, etc., but I'm sure the running track has those glitch-causing items in spades. Trust me: it's more fun to keep the car close by where you can see it. —Pete

## But Seriously ...

Concerning the frequent use of the term "rides" in your magazine, how does one "ride" an RC



model car? Sounds silly, doesn't it? The time, effort and money that people put into these small engineering marvels warrant a more sophisticated description than dumbed-down kid language. Please take it seriously. [email] CHUCK

OK, Chuck; from now on, "Readers' Rides" will be called "Readers' Small Engineering Marvels." I'll also try to take everything as seriously as possible; this hobby isn't about fun, after all. And thanks for setting me straight about the "kid language"—you big poop head. —Pete

## Get Your Circle Cutter Here

I read your article, "7 Steps to a Fast Finish," in the May 2000 issue of *RC Car Action* magazine and tried to find more information on the Olfa circle cutter you mentioned. The article referred to the Index of Manufacturers on page 216, but there is no information on Olfa listed there. I am interested in purchasing one of these circle cutters, so any help would be appreciated. [email] ROBERT UTLEY

Robert, just go to [www.olfa.com](http://www.olfa.com) or call (800) 962-OLFA to order the CMP-1 circle cutter. —Pete

## Triple-XT versus Double-XT

I really dug the comparison you did with the photographs of the Double-X "CR" versus the Triple-XT. But I noticed that the 'CR' rear tire is a Step-Pin, while on the Triple-XT is a Taper Pin. Now

my question is: could the height of the Step-Pin over the Taper Pin contribute to the slightly lower dogbones on the Triple-XT? I really love your mag. Keep up the great job!

DANNY S.

Medford, Long Island, NY

It's always a pleasure to get intelligent letters from guys like yourself. I'm glad you liked the article and pleased that you read each issue so carefully. About the bones: if you look closely, you'll notice that the "ground line" for the Triple-XT is kicked up just a click to compensate for the Double-XT's slightly taller tires. For the side views, I used the rims' mounting nuts to match up the trucks so the tires wouldn't be an issue (if you look closely, you can see the Step-Pin tires peeking out from behind the Triple-XT's Reptile and 8-rib rubber, and the tires are concentric). I still wouldn't call the photos "scientific," but I did take pains to make sure they were as "real" as possible. Great questions; thanks for caring enough to write! —Pete



## Where are the Bikes?

Why don't I see any RC motorcycles or dirt bikes around? Didn't Kyosho used to make two motorcycles? I think it would make an awesome racing class with dirt bikes and motorcycles. What do you think? [email] JOHN RAEDEKE

Kyosho had the "Elec Rider" way back in the early days, and then it had a pair of trick GP-style racing bikes in the early '90s. The last Kyosho bikes were the "hanging-on" series, which featured riders that would pop out a knee to lean into turns! Sadly,

**WRITE TO US!** We welcome your photos, drawings, comments and suggestions. Letters should be addressed to "Letters," Air Age Inc., Radio Control Car Action, 100 East Ridge, Ridgefield, CT 06877-4606. Letters may be edited for clarity and brevity, and each must include a full name and address or telephone number so that the identity of the sender can be verified. We regret that, owing to the tremendous numbers of letters we receive, we can't respond to every one.

## EMAIL ADDRESSES:

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Peter Vieira: [peter@airage.com](mailto:peter@airage.com)  
Greg Vogel: [gregv@airage.com](mailto:gregv@airage.com)

the little bikes never really caught on here. I'm with you though—a race class for bikes would be wild. —Pete

## Which Wheels?

Hi; I recently picked up the new issue; great job, guys! In the article, "7 Steps to a Fast Finish," which car lies under that Dodge Stratus body, and who makes those wheels? That car looks awesome! [email] VINCE GRANA

Glad you liked it! It's a Kyosho TF-4 Type R wearing a set of RPM Avenger wheels. —Pete

## The Mark of Orion

You guys goofed! Mark Francis runs for Team Orion; you had him down as Trinity in the Reedy Race winners' listings (June 2000). [email] BRIAN WHITE

Right you are, Brian. Mark also took second in 2WD and fourth in 4WD for Orion at the Cactus Classic, covered in this issue (and, yes, we got it right in the winners' chart!).

—Pete





BY CHRIS  
CHIANELLI

## JOEL JOHNSON RETIRES

One of RC racing's all-time greats has hung up the transmitter. Joel "Magic" Johnson has been doing a slow fade from RC racing since his glory days, but we could always count on him to hit a big event at least once a year to mop the floor with the competition.

Joel has been enjoying and racing RC for more than 25 years, starting way back in 1974. One-twelfth scale was the most popular class in the late '70s and early '80s, and Joel quickly became the dominant force in the class. Even today, he is considered to be the best of the best in on-road racing and is capable of competing on a world-class level.

But there's more to the Joel story than on-road; he also earned the Off-Road 2WD IFMAR World Champion title in 1987 and has placed nationally and earned TQ status in dirt oval. No matter which class he competed in, Joel was—and is—known for being a consummate professional and sportsman, an articulate ambassador for the hobby/sport and a perfect role model for all racers. Joel, you will be missed at the track.

**An autographed Joel Johnson trading card! Don't look for this on eBay. The Joel Johnson signature motor was a hint of things to come; today, driver-endorsed products are an industry norm. Joel and Trinity are inextricably linked thanks to the Magic Motorsports line and Trinity's careful marketing of Joel as a "brand" (the Warhol-inspired soup can was one of the more clever efforts).**



### "Magic" Moments

There are far too many trophies, plaques and awards out there with Joel's name on them for us to list all his achievements, but here are just some of the most "Magic" moments:

- 1981-'82: ROAR 1/12 6-cell and 4-cell Stock National Champion
- 1983: ROAR 1/12 6-cell Stock and Modified National Champion, 4-cell National Champion
- 1984: ROAR 1/12 6- and 4-cell National Champion and Top Qualifier
- 1984: 1/12 All-Japan National Champion (Joel was the first foreigner to win this event)
- 1987: IFMAR 2WD Off-Road World Champion
- 1989: IFMAR 2WD Off-Road World Champion
- 1990: ROAR Dirt and Paved Oval National Championship Top Qualifier
- 1992: IFMAR 1/16 Mod On-Road World Champion

- 9-time US Indoor Championship winner 1/12 mod.
- 28-time ROAR National Champion

### HYPERDRIVE



FUELS UP

The gas-powered oval car thing is catching on! Hyperdrive, which was recently bought by BSR, is fielding this new top-flight machine that sports a beautifully machined aluminum rear pod, graphite main chassis, Associated Dynamic Strut front end, and a triple-shock suspension setup. We'll get some laps in as soon as Hyperdrive has a production version.

Hyperdrive, distributed by BSR Racing, 109 County Rd. 455, Killen, AL 35645; (256) 757-1564; fax (256) 757-1574.

### ALEX RACING CE-4

The CE-4 is a fully equipped racecar that features a front-motor, rear-battery, 4WD design. The suspension arms are machined nylon, and the rest of the front suspension parts are molded composite. The chassis, upper deck and shock towers are woven carbon fiber. Most of the car's other parts are aluminum. A ball diff with Delrin out-drives spins in the rear, and CV joint axles send power to all four wheels. The car is also equipped with a center shaft and front diff one-way units.

Alex Racing Design; distributed by Sakura Intl., 226 Pacific St., Brooklyn, NY 11201; (718) 935-0333; sakuraUSA@msn.com.



Here's one for all of you T-Maxx owners out there. Traxxas at last has trick hop-up parts for the popular truck, and they are available now! Even the packaging looks cool. Here's what we have so far:

- Transmission skid plate
- Aluminum servo mounts for the throttle/brake servo
- Aluminum pivot-ball caps
- Hard-anodized aluminum pivot balls

### TRAXXAS TRICKS FOR T-MAXX



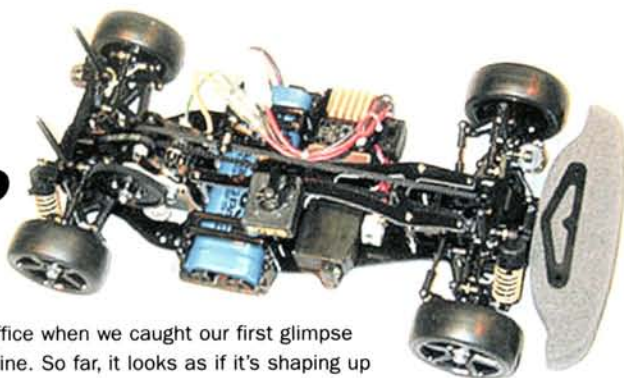
- Titanium turnbuckles
- Fixed differential (for Posi action!)
- Aluminum servo mounts
- Stainless-steel hinge-pin set
- Titanium hinge-pin set



# Tamiya TA04 Pro

**O**ohs and Ahhs filled the air in the RC Car Action office when we caught our first glimpse of Tamiya's new TA04 online. So far, it looks as if it's shaping up as a conventional touring car and borrowing from the design of the 414X tested extensively in the States. Notice the covered front diff case and shapely shock towers; there's even a transponder mount. Right now, it looks as though the chassis is spec'd for a stick pack, which is popular for racing in Japan. Let's hope that Tamiya machines in battery slots for those of us stateside who like to run saddle packs.

Tamiya America Inc., 2 Orion, Alliso Viejo, CA 92656-4200; (800) TAMIYA-A; fax (949) 362-2250; [www.tamiya.com](http://www.tamiya.com).



## HPI NITRO MT FIX SUSPENSION-ARM STEW

**W**e reported front-arm breakage when we tested the HPI Nitro MT for the last issue, and other MT owners have noted similar problems. It's ironic, since the electric MT has been wearing the same arms since 1998 without any pattern of breakage; but then again, the Nitro MT is faster than the typical electric setup and runs longer on a tank than the electric MT lasts on a pack, so that increases the stress on the parts. Anyway, HPI has a fix for you Nitro MT owners: soften the arms by boiling them in water for 10 minutes. The flex-ified arms have more "give," which will usually spare them from being broken (but remember: every part has its limits). HPI does not suggest that you install the optional graphite arms as a way to prevent breakage due to crashing or rough use. The graphite arms are stiffer but more brittle and are likely to break under such conditions. The HPI trucks featured in this issue's "Big Air" article (see page 104) ran boiled arms, and none broke.

## Automatic for the people Hudy goes robotic

The Hudy Power Automatic Comm Lathe brings automated precision to commutator truing. The depth of the cut is still manually adjusted (and you'll have to buy a bit separately), but the carriage passes are made automatically with an electric-powered jackscrew setup. The result is an ultra-smooth cut and a gleaming commutator. Of course, Hudy's ball-bearing armature supports and super-precise construction are part of the clean-cut equation, too. Look for an in-depth test of this new lathe soon.

Hudy; distributed by Serpent USA, 2830 NW 79 Ave., Miami, FL 33122; (305) 639-9665; fax (305) 639-9658; [www.hudy.net](http://www.hudy.net).



# TRINITY

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**TC 3 Gas Conversion**





## NEW TTR HOP-UPS

### ■ FOR TTR EB-4

Type A Ergal Lite chassis, Ergal rear toe block and rear universals. Ergal is an aluminum alloy similar to Duralumin; let's just say it's tough stuff. The channeled, anodized chassis should aid engine cooling as it stiffens your EB-4, and the precision fit and superior durability of the rear toe block will help ward off a DNF. And the universals? Well, who doesn't want universals on all four corners?



### ■ FOR TTR TS-4n

Ergal 3mm chassis, close-ratio 2-speed tranny and center belt tensioner. Forget wimpy 2mm chassis; fat is fast, and 3mm slabs are taking over. For even more grunt, TTR machines the TS-4n optional chassis out of Ergal instead of plain ol' aluminum. The 2-speed isn't for land-speed-record attempts; it's a close-ratio job meant to get you from corner to corner quicker. A side-belt tensioner is a must have for any 3-belt car, and TTR's is a good-looking piece.



By the way, the TS-4n is now offered with your choice of Mercedes CLK-GTR, Volvo S40, or Alfa Romeo body.

TTR; distributed by Ace Hobby Distributors, 116W 19th St., Higginsville, MO 64037; (660) 584-7121; [www.acehobby.com](http://www.acehobby.com).



## GEARBOX BEEF FROM ROBINSON

Stampede, T-Maxx steel spur gears, idler and diff gears for Kyosho Ultimas



**R**obinson Racing Products has expanded its line of steel spur gears to include models for the Traxxas Stampede and T-Maxx. The gears accept the stock slipper pegs and have the additional feature of a factory-installed bearing for smoother slip action and true running.

For you Kyosho Ultima ST Type R owners, Robinson's steel idler gear and hard-anodized 7075 aluminum diff gear will give your tranny the brawn to handle any motor or engine. As usual, the parts are precisely machined and finished.

Robinson Racing Products, 4968 Meadow View Dr., Mariposa CA 9338;  
(209) 966-2465; fax (209) 966-5937; [www.robinsonracing.com](http://www.robinsonracing.com).



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## HPI rolls out Mercedes AMG S-class sedan and Sport 2 Civic Si

If the number of slammed Civics I see cruising every week-end is any indication, HPI will bring a lot of import tuners into RC with the Civic Si-body Sport 2 kit. Sure, it's a great kit with full bearings and all the winning suspension geometry and drive train of the Pro 2, but that Honda Civic Si shell is what will reel them in.



And that Mercedes AMG S-class sedan shell? It fits all 200mm touring car chassis, includes a huge flexible vinyl decal sheet with window lines, headlights, grills, taillights and a full set of Mercedes-Benz and AMG logos—plus window masks and a large, high-downforce wing. As usual.

HPI Racing, 15321 Barranca Pky., Irvine, CA 92618; (949) 753-1099; fax (949) 753-1098; [www.hpiracing.com](http://www.hpiracing.com).

## SHIZUOKA SNEAK PEEK

Next month, assistant editor Greg Vogel will take over "Inside Scoop" to show you the latest gear from the Shizuoka Hobby Show in Japan, but thanks to the magic of the Internet, digital cameras, fiber optics, satellites, bionics and ginko biloba, I have some early scoopage for you.

### Mini-Z Racing

Kyosho's 1/24-scale Mini-Z racers are already available stateside, and they're pretty cool; they use the same Perflex transmitter as Kyosho's new Readysset RTRs, include painted "hard" bodies with scale detail and have fully proportional control with reverse. What you won't find here in the U.S. are these Japanese coin-op Mini-Z racetracks. Drop in a yen (or something), and start driving; sure beats shooting zombies.



FS-40S-C

### O.S. 4-stroke turns .40

Wow! O.S. Engines plans to unleash some big-time thumper power soon. The FS .26 4-stroke has plenty of grunt, so we can only imagine what 35 percent more displacement will do to the trend-setting mill.

### Tamiya XR311 rerelease

Tamiya appears to be ready to rerelease one of its most popular vehicles from the late '70s—the XR311! The sinister-looking military machine was only the fourth RC vehicle to emerge from Big T. No word yet on whether Tamiya will reissue the original chassis or use one of the T-series designs, but we'll keep you posted.

Want more? Check out [www.rccaraction.com](http://www.rccaraction.com) for the latest Shizuoka scoops! ■





Win a \$500 gift certificate from DuraTrax! Send a sharp, uncluttered, well-exposed color photo of your vehicle (no Polaroids), and a brief description, to Readers' Rides, RC Car Action, 100 East Ridge, Ridgefield, CT 06877-4606 USA. If we publish your photo, you'll receive a free RC Car Action decal sheet and will be eligible to win a \$500 gift certificate from DuraTrax in the "Readers' Rides of the Year Contest." Write your address and phone number on your letter and on the back of every photo you send. Good luck!

## Readers' Rides

### Wayne Tugwell T-Maxx Hampton, VA

Cruisin' at the beach is this T-Maxx featuring GS Racing fuel tubing, hand-crafted aluminum-tube bumpers and skidplates and optional 70-tooth spur. A Motor Saver air filter ensures that only clean air enters the carb. Wayne is looking forward to loading his truck with Traxxas options when they are released.



### Michael Nicolls Homebuilt Monster Mini Perth, Australia

This truck features an old Kyosho Turbo Ultima chassis, Tamiya M-chassis gearboxes, ESP Clodzilla suspension arms and standard Clod Buster steering arms. Also included are Tamiya oil-filled shocks and a Tamiya Mini Cooper Monte Carlo body. Michael built the truck in one afternoon, and he reports that the girls at the track really like the pink paint; they think it's awesome!



### Sean Williams Traxxas Stampede Valley Center, CA

Among the hop-ups here are Dynamite red-seal bearings, Team Associated gold aluminum shocks, Traxxas slipper clutch and a Pro-Line Ford F150 body. Electrics include an Airtronics Rival Sport radio, Novak Explorer ESC and Airtronics 94102 servo. Sean says he purchased the Stampede because it did well in Radio Control Car Action's 2WD monster truck shootout. He likes to use his empty pool as a half pipe; the Stampede is, he says, "... a great jump truck."



### Tim Moser "Aircar" Farmington, MI

Tim calls this creation "the Aircar." He started with a Kyosho front suspension then added an O.S. .40 LA airplane motor and buggy body. Everything else is custom, including a system that applies the brakes as soon as he lets up on the throttle. The custom front wing provides downforce to the front of the car and serves as a protective bumper for the front suspension in case of a rollover. Tim says it drives much like a rear-wheel-drive car and is great at doing donuts. Whatever you say, Tim.



## Readers' Rides

### Michael Kaczmarek RC10GT, RC10T3, Mugen Seiki Prime 12 and Losi Double-X 'CR'

Las Vegas, NV

The RC10GT features an O.S. engine along with several RPM and Trinity aftermarket parts. A Reedy Rage motor powers the RC10T3, while an O.S. engine runs the Mugen Seiki Prime 12. All cars have Pro-Line tires, except for the Losi Double-X 'CR,' which has Losi tires.



### Daryl Duke Traxxas Stampede Bossier City, LA

A Trinity Speed Gems 2 Sapphire motor powers this Stampede. It's also equipped with a Novak Rooster ESC, full set of ball bearings, slipper clutch and a custom-made fiberglass chassis. Daryl cut away the stock plastic motor plate and bolted on a Losi Double-X aluminum motor plate; it makes "a tremendous difference in cooling the motor" compared with the original.



### Mike Powers Losi NXT Carthage, NC

This custom-painted truck is equipped with full ball bearings, a Trinity/Picco Speed series .12 engine and a CVEC tuned pipe. Mike uses an Airtronics M8 radio. His wife gave him the truck as a Christmas present—lucky guy!



### Brian Murray HPI Nitro RS4 Rohnert Park, CA

This car, styled after racer Mark Martin's Eagle One full-size racecar, is powered by an HPI .15 Fe Nitro engine and has an MIP boost bottle, HPI tuned pipe with header, a 2-speed tranny and MIP clutch. Other features include HPI Supershocks, MIP CVDs, sway-bars and HPI "Pro" compound radial tires. Brian uses an Airtronics radio, receiver and servo to control the car.







# Z Introducing th

1 / 1 0 4 w d

**D**esigned by world renowned Franco Sabattini and manufactured at Thunder Tiger's super-modern facility, the TS4N is the first in a series of high performance touring cars. Early in the first year of its existence, the TS4N is already sweeping Europe with first place wins in France and Italy, logging lap times much faster than any of the competition.

The TS4N is a 1/10th scale four wheel drive nitro powered touring car that combines many sophisticated performance-enhancing features that represent a culmination of 30 years of Sabattini's design experience. The car comes in three body styles and is 90% assembled with a powerful, user friendly Thunder Tiger PRO-12BZX with pull start and tuned pipe furnished and installed.

Aluminum top deck, shock body, and shock towers

Strong, fiberglass reinforced Dupont plastic parts

Three belt, 4WD drivetrain

Front universal drive shaft.

High performance GRP rubber tires

Three-point rear suspension link

Double wishbone front suspension

On-road style front knuckle

True Ackerman steering system

Fully adjustable fr caster, fr/rr camber,

fr/rr toe-in, and fr/rr track width

Adjustable belt tension cam

Full ball bearings throughout

Silicone oil filled shocks

Two hole shock piston (front)

Three hole shock piston (rear)

Color coded springs

Adjustable shock spring tension clips

Official, colorful sponsor decal sheet

Pre-cut foam bumper

Steel turnbuckles

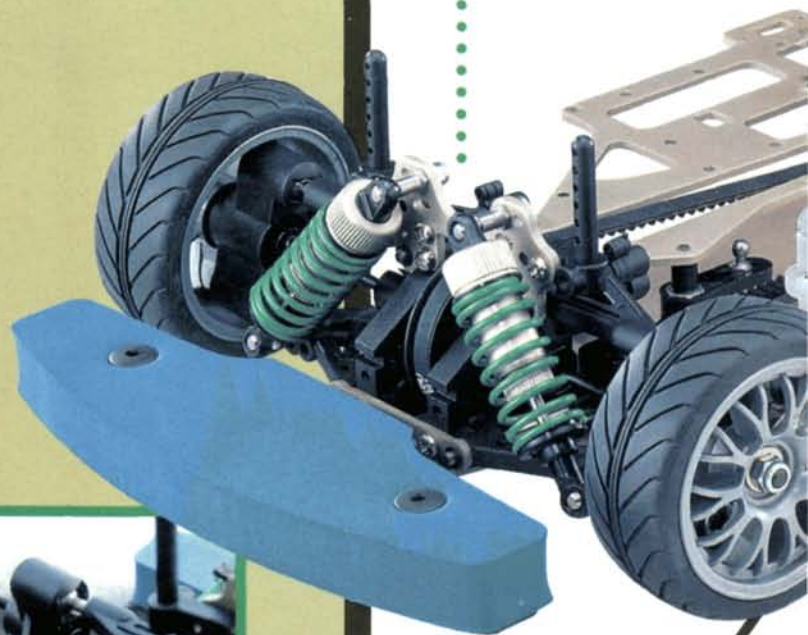
Super low CG design

Full array of options

Requires 2-channel radio

Future releases will include completely ready-to-run versions and electric versions. All cars in this series will share 80% parts compatibility plus upgrade and conversion packages will be available.

As with all of Thunder Tiger cars, the TS4N offers performance that is value priced. Go see your hobby dealer today and get ready to roar with Thunder Tiger!



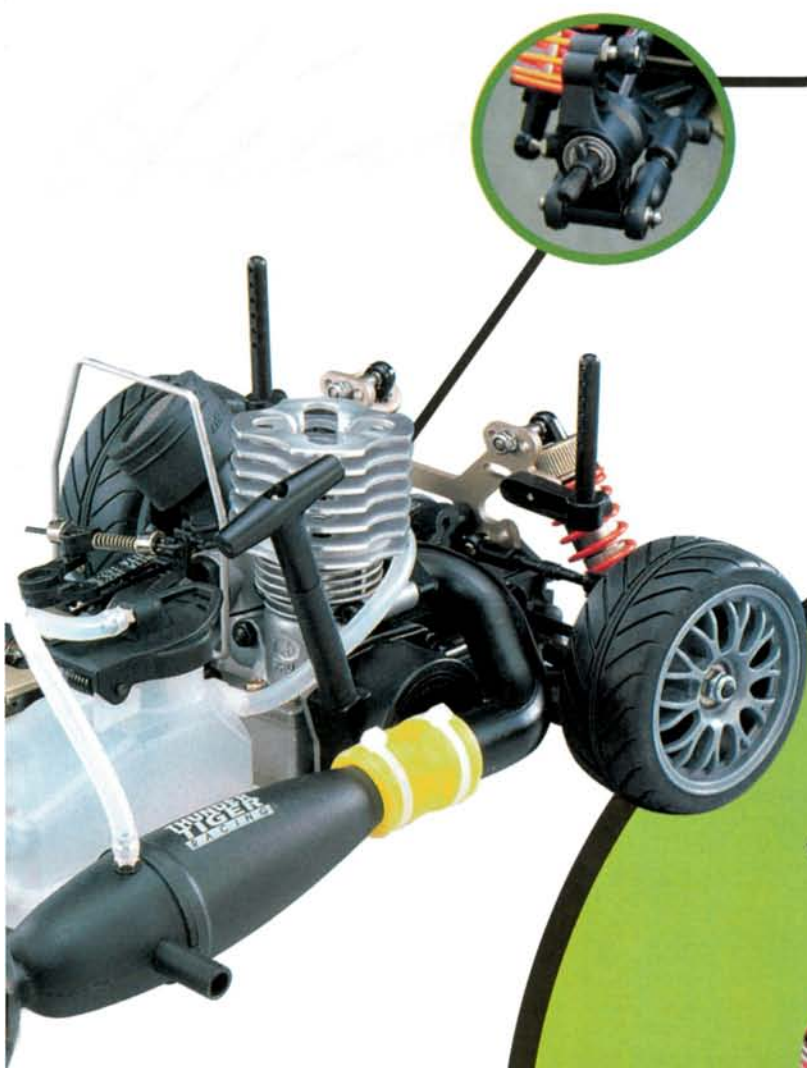


# e future: **TS-4n**

## n i t r o s e d a n

T S 4 N

- 90% assembled.
- PRO-12BZX included.
- Three belt, 4WD drivetrain.
- Fully adjustable suspension
- Front universal drive shaft.
- Aluminum top deck, shock body, and shock towers.
- Official sponsor decal sheet.



ttr6134-a volvo



ttr6136-a alfa romeo



ttr6135-a mercedes-benz

 **Thunder  
Tiger** TEAM  
INTERNATIONAL

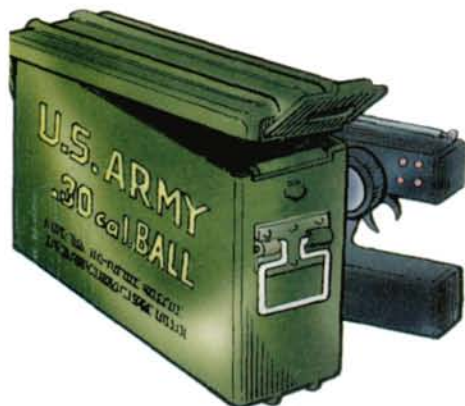




## Pit Tips

BY JIM NEWMAN

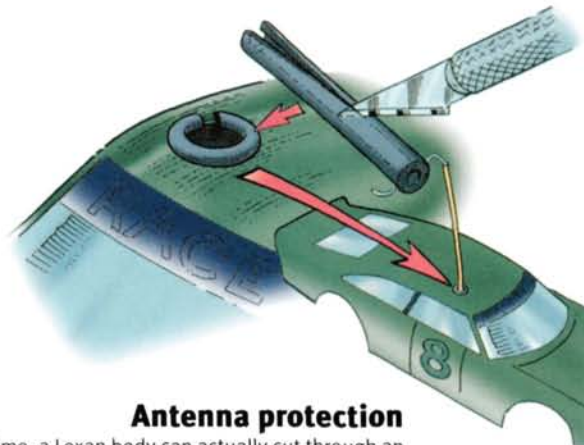
**WIN AN OFNA Z-10 RALLY!** Radio Control Car Action will give a 6-month subscription (or extend an existing subscription) to the author of each idea used in "Pit Tips." "Top Tip" winners receive an OFNA Z-10 Rally kit. All published "Pit Tip" authors receive an OFNA yo-yo. Send a rough sketch to Jim Newman, c/o Radio Control Car Action, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. We're unable to publish many good tips because we don't have the sender's name and address. Please note: because of the number of ideas we receive, we can neither acknowledge every one nor return unused material.



### Heavy-duty storage

Surplus army ammo boxes are useful for keeping your RC goodies protected. The boxes are easy to pack, and their multiple handles make them easy to carry. They feature watertight lids, too. They can be found at flea markets and at army-surplus stores.

CHRIS JOCHEM  
Cary, NC



### Antenna protection

In time, a Lexan body can actually cut through an antenna tube. Take a small length of fuel tubing and split it down the middle, then wrap it around the antenna opening to protect the antenna tube.

ROBERT WAGNER  
Aspen, CO



### Easy-pull crystal

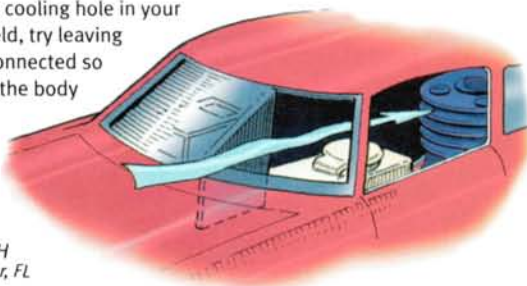
Some receiver cases make it difficult to reach the pull tab on your receiver crystal. Wrap a small piece of fishing line around the crystal and tape it into place. Be sure that the end of the fishing line is long enough so that you can easily pull out the crystal when it is in the receiver.

MICHAEL NORTON  
Port Alberni, British Columbia, Canada

### Receiver guard

Next time you cut a cooling hole in your nitro car's windshield, try leaving the excess Lexan connected so you can fold it into the body to act as a splash guard that will prevent fuel from splashing onto your receiver.

JOHN BOATH  
Clearwater, FL

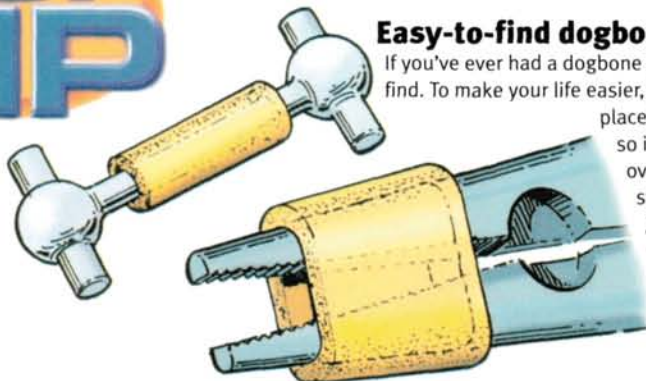


## TOP TIP

### Easy-to-find dogbone

If you've ever had a dogbone pop out, you know how difficult it is to find. To make your life easier, take a small piece of fuel tubing and place it on the dogbone; use a bright color so it really stands out. Slip the tubing over a pair of needle-nose pliers to stretch the tubing over the bone.

AARON HUNT  
Lehigh, FL





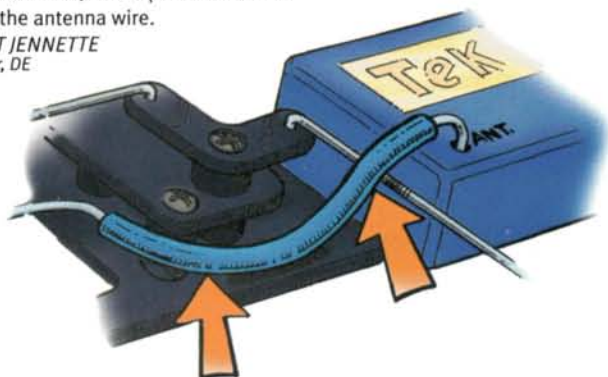


## Pit Tips

### Antenna wrap

Use a piece of insulated wire to protect the exposed portion of your receiver antenna between the receiver and the antenna mount. Split the wire down the side, remove the wire inside the insulation, and slip the insulation over the antenna wire.

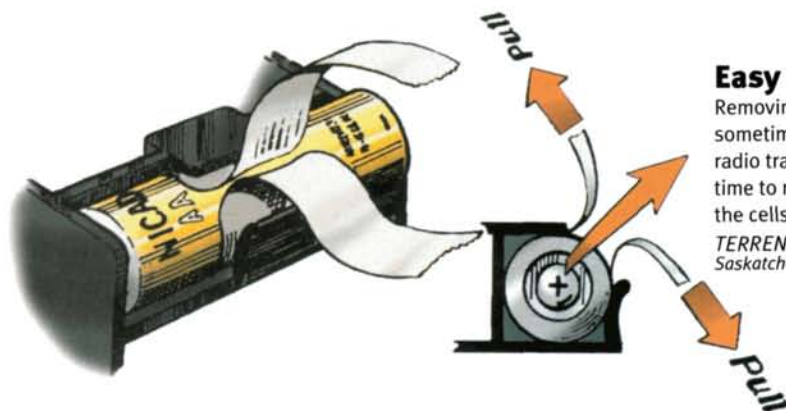
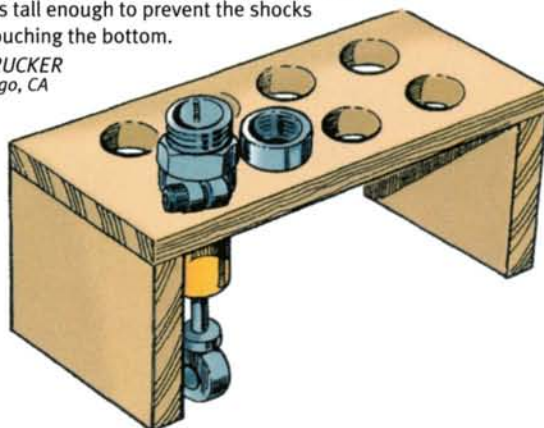
MATT JENNETTE  
Dover, DE



### Easy-build shock stand

This shock stand is made from scrap lumber. In the top of the stand, drill holes that are large enough for the shock bodies to fit into, and make sure that the stand is tall enough to prevent the shocks from touching the bottom.

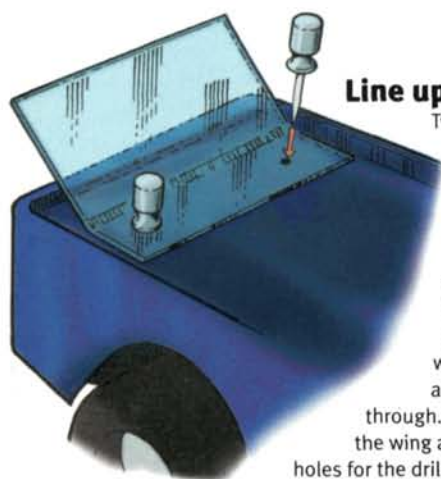
JOHN RUCKER  
San Diego, CA



### Easy cell removal

Removing your old batteries from a battery holder can sometimes be a chore. Place a piece of ribbon in the radio tray before you install your new cells. When it's time to replace the batteries, simply pull on the ribbon; the cells will pop right out.

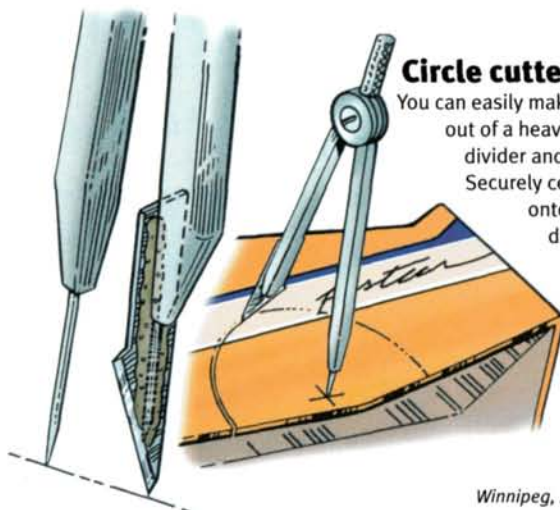
TERRENCE NIMEGEERS  
Saskatchewan, Canada



### Line up that wing

Two pushpins can make it much easier to mount wings on your Lexan body. Poke a pushpin through the wing at each end. Line up the wing on the body, and push the pins through. Use the holes in the wing and body as pilot holes for the drill or reamer when you make your holes for the screws.

STEVE KNEPP  
Clearfield, PA



### Circle cutter

You can easily make a circle cutter out of a heavy-duty compass divider and a hobby blade. Securely cement the blade onto one end of the divider; leave the other end as is. Make light passes until you've scored the plastic deeply enough to peel out the waste material.

STEVE CONG  
Winnipeg, Manitoba, Canada





# Troubleshooting

BY DEREK BUONO • ILLUSTRATIONS BY JIM NEWMAN

If you have a technical problem that your hobby shop or racing friends can't resolve, give us a shout at *Radio Control Car Action*, and we'll see if we can chase down an answer for you. Questions should be of a technical nature and should be addressed to *Troubleshooting, Radio Control Car Action*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. We regret that, owing to the tremendous number of letters we receive, we can't respond to every one.

## Too-Tall T3

I have an Associated RC10T3. I don't race it, but I like to drive it in the woods. I would like it to handle bumps better. I set it up so it has maximum ground clearance, but it still gets knocked upside-down a lot. What's wrong?

TOM BAILEY

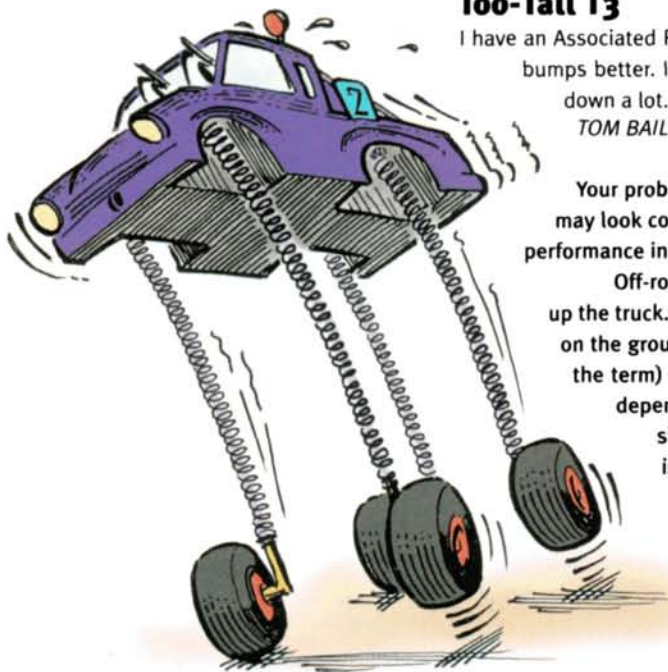
Your problem is a fairly common beginner's mistake. The T3 is a racetruck, and although it may look cool with the suspension jacked to the moon, this setup hurts rather than helps its performance in the rough.

Off-road vehicles of any type must be set with "sag"; this is easily visible when you pick up the truck. As you lift the chassis, the shocks should extend in an effort to keep the wheels on the ground. When you put the truck down, you'll notice that the suspension sags (hence the term) under the weight of the chassis. Exactly how much sag your suspension needs depends on the surface you run on, but your truck should always be set so that the shocks can both extend and compress from their "at rest" position when the truck is sitting on its wheels.

A "drop test" will confirm that the truck is dialed in properly: just lift the truck about 2 feet off the ground (or your bench top), hold it parallel with the surface, then drop it. The suspension will soak up the landing and settle. From this point, you should be able to

pick up the truck and see the shocks extend as you lift it; likewise, you should still have enough travel after the drop test to press the chassis down and see the shocks compress. It's OK to run the truck a little "tall" for greater ground clearance,

but for best results, you should set it up so the rear arms are parallel with the ground or raised just slightly from this setting. Then adjust the front shocks so that the chassis is parallel with the ground, as viewed from the side.



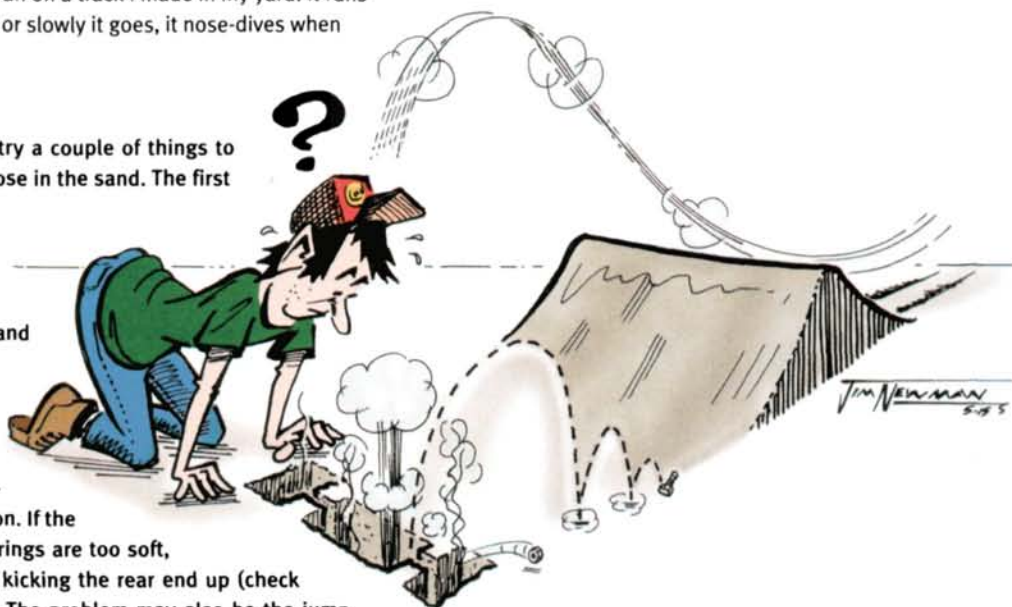
JIM NEWMAN  
5-20-5

## Crash Master

I have a Kyosho Sandmaster buggy that I run on a track I made in my yard. It runs fine, except on jumps. No matter how fast or slowly it goes, it nose-dives when I jump it. What can I do to fix this?

BRIAN FOSTER

The dreaded nose-diving jump. You can try a couple of things to stop your Sandmaster from sticking its nose in the sand. The first technique has to do with throttle control; your car's attitude can be controlled with the throttle and brake. In a nutshell, applying throttle in the air causes the car to lower its rear wheels, and tapping the brake causes it to lower its front wheels. It takes some practice not to overdo it and "loop out," but I'm sure you'll catch on quickly. If you cannot cure the problem with that technique, it's time to check out the suspension. If the rear ride height is too low or the rear springs are too soft, the chassis could be bottoming out and kicking the rear end up (check the damping, too; thicker oil may help). The problem may also be the jump itself; if it is too steep or the ground doesn't transition smoothly from the flat surface to the face of the jump, it may kick the car into a nosedive, no matter how well you set it up.



JIM NEWMAN  
5-18-5





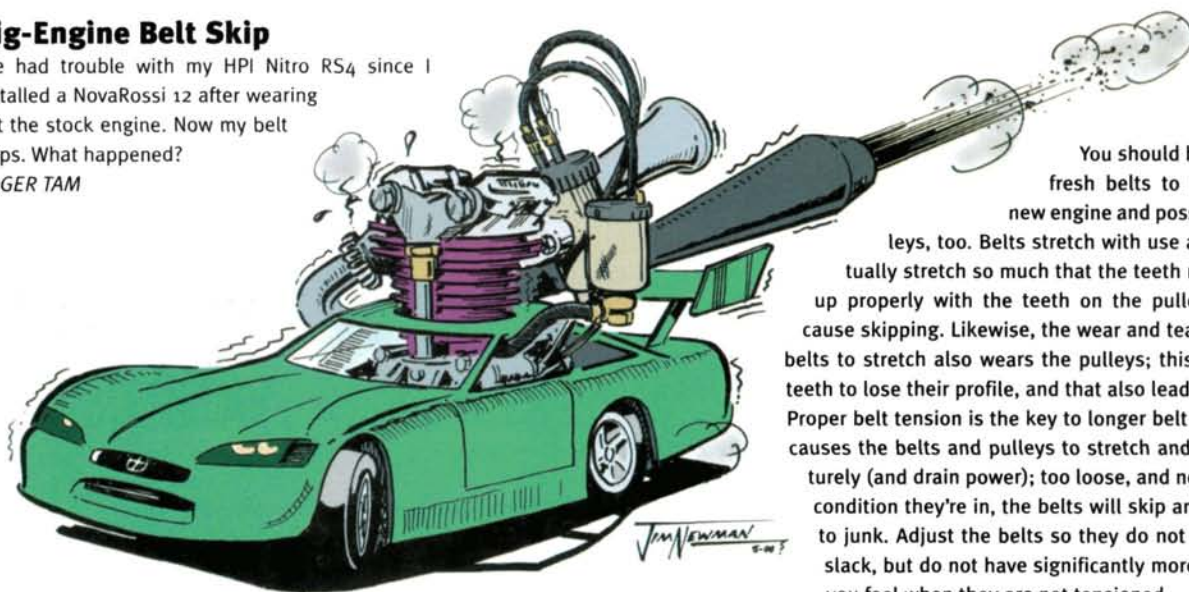
ROBINSON RACING PRODUCTS

## Troubleshooting

### Big-Engine Belt Skip

I've had trouble with my HPI Nitro RS4 since I installed a NovaRossi 12 after wearing out the stock engine. Now my belt skips. What happened?

ROGER TAM



You should have installed fresh belts to go with your new engine and possibly new pulleys, too. Belts stretch with use and can eventually stretch so much that the teeth no longer line up properly with the teeth on the pulleys. This will cause skipping. Likewise, the wear and tear that causes belts to stretch also wears the pulleys; this causes their teeth to lose their profile, and that also leads to skipping. Proper belt tension is the key to longer belt life; too tight causes the belts and pulleys to stretch and wear prematurely (and drain power); too loose, and no matter what condition they're in, the belts will skip and be reduced to junk. Adjust the belts so they do not have obvious slack, but do not have significantly more friction than you feel when they are not tensioned.

### Unequaled Precision

#### RS4 Nitro Vented Flywheel



Precision CNC machined from light-weight aluminum, this vented flywheel blows air over the clutch shoes, improving performance and extending shoe life.  
RRP 1570  
RRP 1571 Pull Start

### ALL NEW ITEMS

#### Nitro Stampede Hardened Steel Spur Gear With Bearing



Precision machined one-at-a-time from a single piece of steel and then hardened this 65T spur will last and last. A sealed Ball Bearing is included. RRP 8565

#### TC3 Lite Aluminum Outdrives



Blue anodized and 40% lighter than stock ball diff outdrives. RRP 1475

### Unsurpassed Reliability

### Outstanding Performance

#### Kyosho Ultima Blue Lightened Slipper Kit



The rear plate is hard anodized to reduce wear and the front plate is color treated. The front plate is designed to hold the slipper pad forcing the pad to slip on the rear plate. When pad shows sign of wear just flip it over for a new surface. Metal parts are CNC machined for a flawless fit. RRP 7515

#### TC3 Ultra 48P Spurs



Tough, smooth and quiet. These new spurs are precision machined from heat-resistant plastic, to mesh flawlessly with our Pinions. 48P Ultra Machined Spurs are available in even numbers from 70T thru 80T, RRP 1670 - RRP 1680.

[www.robinsonracing.com](http://www.robinsonracing.com)



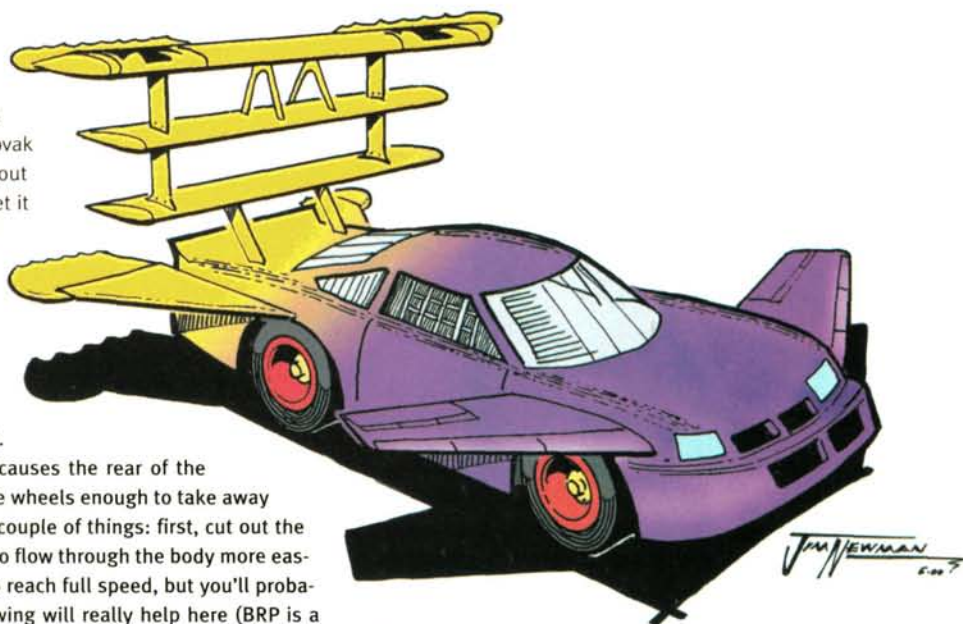
## Spun-Out Sport

I have a Bolink Sport 2000 with a Monte Carlo body that I run in my street with a Trinity Chameleon motor and Novak Duster speed control. It works OK up to about  $\frac{1}{2}$  throttle, but it spins out as soon as I get it going fast. I have tried loosening and tightening the diff, and I installed softer rear tires, but nothing helps.

MIKE DOMINGUEZ

Your car is spinning because of bad aerodynamics. I bet that the rear panel of your Monte Carlo is completely intact.

This traps air under the trunk area and causes the rear of the body to lift at speed. This "unweights" the wheels enough to take away traction, and the car spins. You can try a couple of things: first, cut out the rear panel up to the trunk lid to allow air to flow through the body more easily. This should be enough to allow you to reach full speed, but you'll probably need more traction for turns. A rear wing will really help here (BRP is a good source), or if you really don't care how your car looks, a Lexan buggy wing will do the trick. You'll need wing buttons, music wire and wing mounts to install the wing on the rear pod (all should be available at your local hobby store, along with installation advice). With the wing installed on the pod, its downforce is applied directly to the chassis—not to the body—and your car will really stick. Don't be surprised if you have *too much* rear traction when you've finished. ■



## Superb Quality

**T-Maxx/Nitro Rustler  
Hardened Steel  
Spur Gear With  
Bearing**



Precision machined one-at-a-time from a single piece of steel and then hardened this 72T spur will last and last. A sealed Ball Bearing is included. RRP 8572

**Rustler/Stampede/Bandit/Sport Nitro/Electric Sun Gears**



CNC Machined from a from bar stock, these hardened, Sun Gears will last longer in your Traxxas machine. No serious racer should do without these gears. RRP 8500.

## Intelligent Innovation

**Ultima GP-R  
Hardened  
Steel Idler  
Gear**



Cut from solid steel stock, this gear is lightened and then hardened for super quiet precision and extra long life. RRP 7505

## Thoughtful Design

**Ultima GP/EP-R  
Hardened  
Diff Gear**



Hard anodized, precision machined aluminum diff gear. RRP 7500



**1999 World Cup and  
National Champion**

"I only care about performance, and that's why I run Robinson Racing gears and slipper clutches exclusively."

— Richard Saxton

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NEW  
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by the staff of RC Car Action

**J**udging by the difficulty we had in deciding the "2000 Car of the Year," it has been a very good year for RC. Kyosho released a new SuperTen; HPI delivered updated Pro-series cars; Team Losi's Triple-X redefined off-road. Picking just one car from these and others to represent the best of 2000 was neither easy nor a decision we made quickly. While the editors each brought passionate opinions to the table, our discussions were soon distilled into consensus. We kept returning to a competition car that not only performs exceedingly well in the hands of any driver but will also impact its category for years to come, thanks to its innovative, next-step design. For 2000, the Serpent Impulse is the Radio Control Car Action "Car of the Year."

# SERPENT IMPULSE

## WHY IT WON

While the Serpent Impulse deserves praise for its high-quality manufacturing and capable racetrack performance (and these were certainly factors in our selecting it), the number-one reason we picked the Impulse as our Car of the Year is its evolutionary chassis layout and the way it is already shaping the face of nitro touring car racing.

Before the Impulse appeared, nitro sedans were little more than electric car

retreads. Frankly, no one complained; the cars were (and are) fast, fun to drive and reasonably durable. The designs weren't "broke," so to speak, so no one was "fixing" them.

Serpent had a different take on pavement performance, however, thanks to its many years at the top of the nitro on-road food chain with its Impact and Vector endurance machines. These state-of-the-art on-road racers are the "parents" of the Impulse, and they have donated their essential design elements to





the Serpent tourer. The list is long: large-diameter pivot-ball suspension, 3mm 7075 CNC chassis, sealed gear differentials and a 3-belt drive train with varied belt and pulley sizes are just some of its highlights (see "Car of the Year Features" for details). While other manufacturers have tried to add some of these features, none have combined them all and constructed them as robustly. Cars appearing after the Serpent are another story: the Impulse was an eye-opener for many, and the newest top-of-the-line nitro TCs are following its lead

with thicker chassis and more adjustable, on-road-inspired suspensions. For us, that's what makes the Impulse our Car of the Year; not only is it a good car in its own right, but it also stands to improve the entire breed. That can only help the nitro TC scene, and that's more fun for all of us.





## FEATURES

### 1 SERPENT NOVA MEGA SX-12SE ENGINE.

The Impulse is one of very few nitro TCs to include a true racing powerplant. The Nova Mega is built by NovaRossi and includes the special pilot shaft and manifold required to fit the Impulse. If you want to race, picking up an Impulse is like one-stop shopping.

### 3MM 7075 CHASSIS.

If Serpent had stuck with a 2mm chassis but made it out of 7075 aluminum, that would have been something. Conversely, a 3mm chassis made of the usual 6061 stock would have been worth writing home about; but in combination, the extra-thick chassis and 7075 fighter-plane alloy (plus super-clean CNC machining) make an untouchable package when you're talking high strength and low weight.

### 2 SEALED PLANETARY GEAR DIFFERENTIALS.

Extra-strong output gears hint at the Impulse's endurance capabilities, and sealed housings allow you to tune differential action by using silicone diff fluid of a different viscosity.



Attention to detail: this carefully machined bevel prevents the chassis from munching starter wheels, and shows off Serpent's careful craftsmanship.



Since there are no bell-cranks, the servo-saver is a hard-working part. Serpent includes this heavy-duty aluminum-hub unit.



Up- and down-travel limiters allow the Impulse chassis to be set up very precisely.

Serpent built the Impulse to endure long Mains, as the chunky suspension components and large-diameter bearings attest.



### 3 CENTRAL FUEL TANK.

As the Impulse drains its tank, weight distribution remains consistent thanks to the tank's central location. Offset tanks gradually "tweak" the chassis as they empty and get lighter.

### 4 1/2" ON-ROAD SUSPENSION.

The Impulse borrows its front arms directly from the Serpent Impact. Note the wide spread at the base of the arms and the rearward sweep; these are some tough customers. Caster is easily adjusted by sliding the upper arms fore and aft, while large-diameter pivot balls make camber, track and rear toe adjustments simple to do.



Laydown shocks require only a vestige of a shock "tower," and this reduces flexing and helps the suspension work more effectively.

### 5 EXTERNALLY ADJUSTABLE DAMPING.

Threaded shock bodies make preload changes easy, but there's more adjustability inside: two-piece indexed pistons can be set to allow more or less fluid flow to stiffen or soften damping—without disassembly.



Just about every nitro TC uses three belts to spin the diffs, but the Impulse uses a wider rear belt and large-diameter rear diff pulley to better cope with the power of the Nova Mega engine.

The address of the manufacturer featured here is listed alphabetically in "Featured Manufacturers" on page 216. ■







# Tamiya Juggernaut 2

*We tried to break it!*

by Kevin Hetmanski

**Ah, the Juggernaut.** Even before Tamiya's Clod Buster replacement hit the shelves, it was the most talked about truck of 1999. When at last it debuted to instant sales success, it remained a hot topic—for all the wrong reasons, unfortunately. A well-publicized drive-train durability problem sidelined the Jug, and despite Tamiya's generous free factory fixes, a satisfactory solution to the problem required drastic measures. Big T decided to pull the Juggernaut and tool up a bunch of new parts for a "sequel," and that brings us to the Juggernaut 2. Tamiya's engineers went all out to make the truck unbreakable, so I went all out to break it. I think you (and Tamiya) would expect nothing less.







## DATA CENTER

VEHICLE TYPE  $\frac{1}{10}$ -scale  
4WD/4WS electric monster truck

**BEST BUYER** Monster truck lovers;  
serious backyard bashers

**KIT RATINGS** (poor, satisfactory,  
good, very good, excellent)

**Instructions** Excellent

**Parts fit/finish** Very good

**Durability** Good

**Overall performance** Good

## SPECIFICATIONS

SCALE  $\frac{1}{10}$

STREET PRICE \$350

### DIMENSIONS

**Wheelbase** 11.02 in. (280mm)

**Width** 14.75 in. (375mm)

### WEIGHT

**Total, as tested** 179 oz. (5,074g)

### CHASSIS

**Type** Ladder

**Material** Aluminum/ABS

### DRIVE TRAIN

**Type** Shaft

**Primary** Pinion/spur

**Drive shafts** Telescoping universal  
joint

**Differential(s)** Metal bevel gear

**Bearing type** Combination of  
bearings and bushings

### SUSPENSION (F/R)

**Type** Solid axle/leaf-spring/coil-over

**Damping** None

### WHEELS

**Type** One-piece chrome-  
plated plastic

**Dimensions** (DxW) 2.91x3.7 in.  
(74x94mm)

### TIRES

**Type** Rubber Terra tread

### ELECTRONICS

**Motors** Mabuchi 540 (2)

**Battery** Not included

**Speed control** 3-speed  
mechanical with reverse

**Top speed** 16mph with  
14T modified motors

## LIKES

- Big scale looks.
- No more drive-train problems.
- Awesome scale Ford body.

## DISLIKES

- Tips easily when steering.
- Bouncy ride.
- Steering is a bit touchy.





## building & setup tips

I know what you're thinking: how can there be any setup tips for this truck? It's a monster truck; there's nothing to adjust. True, but here are a few tips to make your building experience a little easier.

**Step 3.** Liberally apply a coat of thick grease to the shaft that the main drive gear spins on, even if you install bearings. The grease prevents the main gear from vibrating on its shaft, and that keeps the transmission operating smoothly. If you can, substitute thick grease for the relatively "thin" kit lube; thicker grease will be displaced less easily and will last longer.

**Steps 24-29.** Pay close attention to the number—and the position—of screws installed in the chassis sides. Some screws are supposed to be left out.

**Step 43.** The tires fit tightly, but if they aren't glued to the rims with CA, they will slip—especially if you run mod motors. Before you do any gluing, you must scrape the chrome plating off the rims where the tires will seat. Don't skip this step! If you don't remove the chrome first, the glue will just pull the chrome off the wheel.

## How Tamiya Built it Better

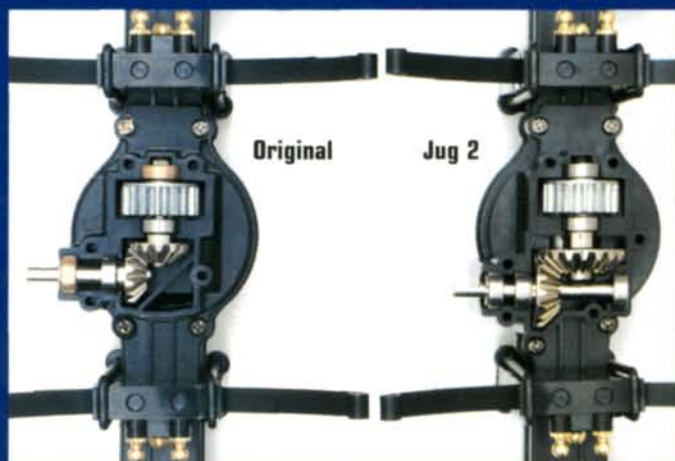
**TRANSMISSION HEAT SINKS.** There are two heat sinks on the outside of the center gearbox. They keep the temperature of the gear shafts down, and this, in turn, prevents the gears from heating up. This is not as much of an issue when you run bearings instead of bushings, but it shows Tamiya is taking no chances.

**HEX-MOUNTED LOWER DRIVE GEAR.** The lower drive gear now uses a large aluminum hex hub that is pressed into the gear. The gear/hex unit fits over a splined shaft. Everything is held in place with an E-clip on both sides. The old setup used a gear that fit over a small hex piece. The hex and output shaft were one unit; this was also held in place with E-clips.

**PRECISION UNIVERSALS.** The universal joints on the drive shafts are rebuildable, and they have been manufactured with greater tolerances for less slop.



**BEEFIER AXLE PARTS.** The bevel gears are now twice the size of the old gears. The bevel-gear shafts run straight through the gear and are supported on both sides by bearings. The old bevel gears had a ratio of 1:1; the new set has a ratio of 1.2:1. This slightly lowers the overall gear ratio of the truck, which eases the load on the drive parts.



**OTHER CHANGES.** In addition to the drive-train changes, the Jug 2's servo-saver has an extra hole in it for more tuning options. The upper plate now has a small section molded into it to accept a receiver, and all of the new plastic components have "2000" stamped in them so they can easily be distinguished from the original Jug parts. You know what that means, don't you? There's bound to be a collectors' market for "pre-2000" Jugs in the future. If you have one, keep it stock, and if you haven't built it yet—don't!



## KIT FEATURES

The Jug 2 has the same features as the original but with beefier drive-train components (for details, see "How Tamiya Built it Better"). In case you missed our original Juggernaut review (July 1999), here are the truck's highlights:

- **Aluminum/ABS chassis.** Four pieces of stamped aluminum and a pair of ABS plastic rails are joined by plastic bulkheads in the front and rear of the truck. Aluminum bash plates are also provided. Right out of the box, the aluminum chassis parts give the Jug an "aftermarket" look.
- **Four-link suspension.** Molded links tie the front- and rear axle assemblies to the chassis via large-diameter pivot balls. Authentic-looking (and stiff) leaf springs are attached to the axles with miniature shackles and keep the floating axles centered under the chassis. Each axle is also sprung by four coil-over "shocks" that are undamped and more decorative than functional.



The new upper radio tray has a molded section to hold the receiver. A rubber strap holds it in place; no more having to wrestle with double-sided tape to pull out your receiver.

## Not Again!

The Jug 2's first run was a disappointment; something was binding in the drive train, and

the truck made an awful noise. When I ran the truck on a long stretch of pavement, I was occasionally able to find just the right throttle position to allow the drive train to "free up," whereupon the Jug would quickly accelerate smoothly to a more appropriate top speed. Something was up, so I took the drive train apart to see what could be wrong. After I had changed gears, bearings, motors and the layshaft, the tranny still had the problem. After much experimentation, I narrowed down the problem to the main drive gear shaft. Because I installed bearings in the main gear, I did not lube the shaft as the manual suggests for the bushings that come with the kit. It turns out that the shaft is just slightly undersize, and there is some play between the bearings and the shaft; this allowed the gear to rock ever so slightly—just a tick. This play caused the gear to vibrate on the shaft, and it was enough to cause the two motors that drive the gear to "fight" each other and run slowly. I added a coat of thick grease to the shaft, which damped the vibration and solved the problem. After that had been taken care of, I couldn't break the tranny if I tried—and believe me, I tried.

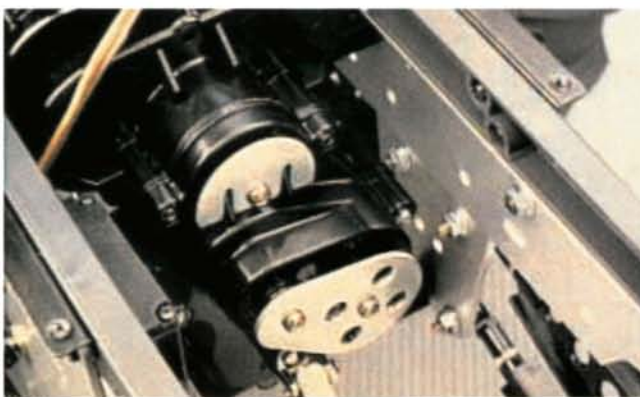
- **Dual-motor drive train.** Unlike the Clod Buster's one-motor-per-axle setup that required the rear motor to operate in reverse, the Jug uses two standard motors bolted into a central gearbox held between the frame rails. The two motors straddle a single drive gear to spool up the gearbox. Power is transferred from the center transmission to the axles through telescoping universal drive shafts. Bevel gears spin the differentials, and they, in turn, drive outside hubs and drive the axles—units borrowed from the Clod Buster. A combination of bearings and bushings keeps the rotating parts turning smoothly.

- **Four-wheel steering.** Like full-scale monster trucks, the Jug uses a four-wheel-steering system. A single servo is mounted between the chassis rails, next to the center gearbox. The servo is connected via linkage to a fully adjustable servo-saver system on each axle.



As you can see, the suspension is the same as the original truck's. Leaf springs combined with coil-over shocks give the truck a very bouncy ride. The axle has "2000" molded into the case. This makes it easy to differentiate the old parts from the new.

- **Ford F-350 "hard" body.** A beautifully detailed ABS Ford F-350 Super Duty body tops off the Jug and features a detailed grill, bumpers and roll bar with lights (they aren't functional, but Tamiya offers a light kit, including bulbs, for the headlamps and light bar). The bed of the truck is hinged to allow easy access to the battery; it's held down by body mounts, and



The new transmission case has these small metal heat sinks attached to them. The screws that hold them in place are threaded into the gear shafts. This reduces the heat on the gear shafts and prevents the transmission case from melting and misaligning the gears.

## Airtronics

### Caliber 3PS radio

When you run a truck this size—with this much speed—you always want to be in control, so I chose to use my Airtronics® Caliber 3PS radio. With its great variety of functions, its settings can easily be tweaked to fine-tune the truck's handling.

### Airtronics 94738 servo

A high-torque servo is a must in a monster truck. This servo has a claimed torque of 71 oz.-in. at 4.8 volts and a transit speed of .21 second—perfect for this application.

### Reedy Pulse R motors

I wanted to give the Jug's drive train a real workout, so I decided to use Reedy® Pulse R 14-turn triple motors. These rebuildable, machine-wound, bushed modifieds are inexpensive but fast.

### Reedy R3K 3000 NiMH pack

Two modified motors will drain a pack in a hurry, so I went for maximum milliamps with NiMH packs from Reedy. Six, 3000mAh cells kept the Jug running long and strong.

### LRP F1 Pro Reversing ESC

The F1 Pro is LRP's® new top-of-the-line reversing ESC. You can use it with any modified motor, and it has thermal shutdown protection and proven reliability, based on my experience with the Bullet—the very similar ESC that it replaces.

**YOU'LL NEED** ■ 2-channel transmitter and receiver ■ 2 servos (or an ESC and servo—high-torque preferred) ■ 6-cell stick pack ■ CA for mounting the tires ■ Enamel paint for the body

**FACTORY OPTIONS** ■ 1150 sealed ball-bearing set (2 pieces)—part no. 53029 ■ 850 sealed ball-bearing set (4 pieces)—53030 ■ 1260 sealed ball-bearing set (2 pieces)—53065 ■ Monster truck aluminum steering-rod set—53385 ■ Monster truck aluminum damper set—53369 ■ Monster truck aluminum suspension-arm set—53383 ■ RC light-bulb set (for monster truck)—53370



the cab is attached to the chassis with screws. Unlike clear bodies, the Jug's white shell must be painted on the outside. The "glass" is separately molded in smoked plastic.

### PERFORMANCE

After I had fixed a transmission-chatter problem that marred my first run with the Jug 2 (see "Not Again!"), I was ready to give the truck a thorough thrashing. With the first tug of the trigger, the truck pulled an explosive wheelie and refused to lower its wheels until I chopped the throttle. The two 14-turn Reedy motors moved the Jug along at an impressive speed, but the stiff suspension caused it to bounce uncontrollably over bumps, and either a wide arc or much deceleration was required to turn the truck; otherwise, the Jug would roll onto its roof. When I drove it hard, the truck flipped over a lot, and the hard plastic body quickly deteriorated. Eventually, the rear body mounts completely poked through the bed area of the body, and the body suffered many cracks in the roof and hood panels. Given the time required to finish the body and the cost of replacing it, it's best to use a Lexan body for hard running and save the kit body for cruising and static display.

To test the durability of the drive train, I ran the truck full throttle forward then dumped into reverse and vice versa. I also landed jumps on pavement without letting off the throttle, and then I hopped the front wheels up and down the *RC Car Action* parking lot by stabbing the throttle repeatedly. No breakdowns or funny noises occurred during four packs' worth of such abuse, but I decided to pull the transmission apart to be sure everything really was OK.

With the tranny and axles disassembled, I saw a little wear on the universal joints that caused them to develop some backlash, but otherwise, the parts looked as fresh as the day I installed them. As I reassembled the drive train, I decided to try running the Jug with a single motor; in my opinion, having two was overkill, and I welcomed the thought of increasing the Jug's run time. One motor was plenty! The truck still wheeled on command, and I gained an extra two or three minutes of fun (depending on the pack).

### THE VERDICT

The Juggernaut 2 retains the scale appeal that caught our eye the first time around, and Tamiya has fixed the drive-train gremlins. That leaves us with an attractive machine that's fun to tool around with but, like its predecessor the Clod Buster, the Jug 2 needs some modification before it can tackle real off-road terrain without getting bounced off course (or upside-down). That will come later; in the meantime, don't shy away from the Jug 2 because you're worried about durability (with the exception of the body, natch). I put my truck through its paces, and it kept coming back for more. You can bet there will be plenty of Jug 2 tips in upcoming editions of my "4x4" column, so stay tuned! If you have any hop-up/setup/tuning tips of your own, shoot me an email at kevinh@airage.com, or write to me at "4x4," c/o *RC Car Action*, 100 East Ridge, Ridgefield CT 06877-4606 USA.

\* Addresses are listed alphabetically in "Featured Manufacturers" on page 216. ■



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**TRACK  
TEST**  
1/10-SCALE NITRO



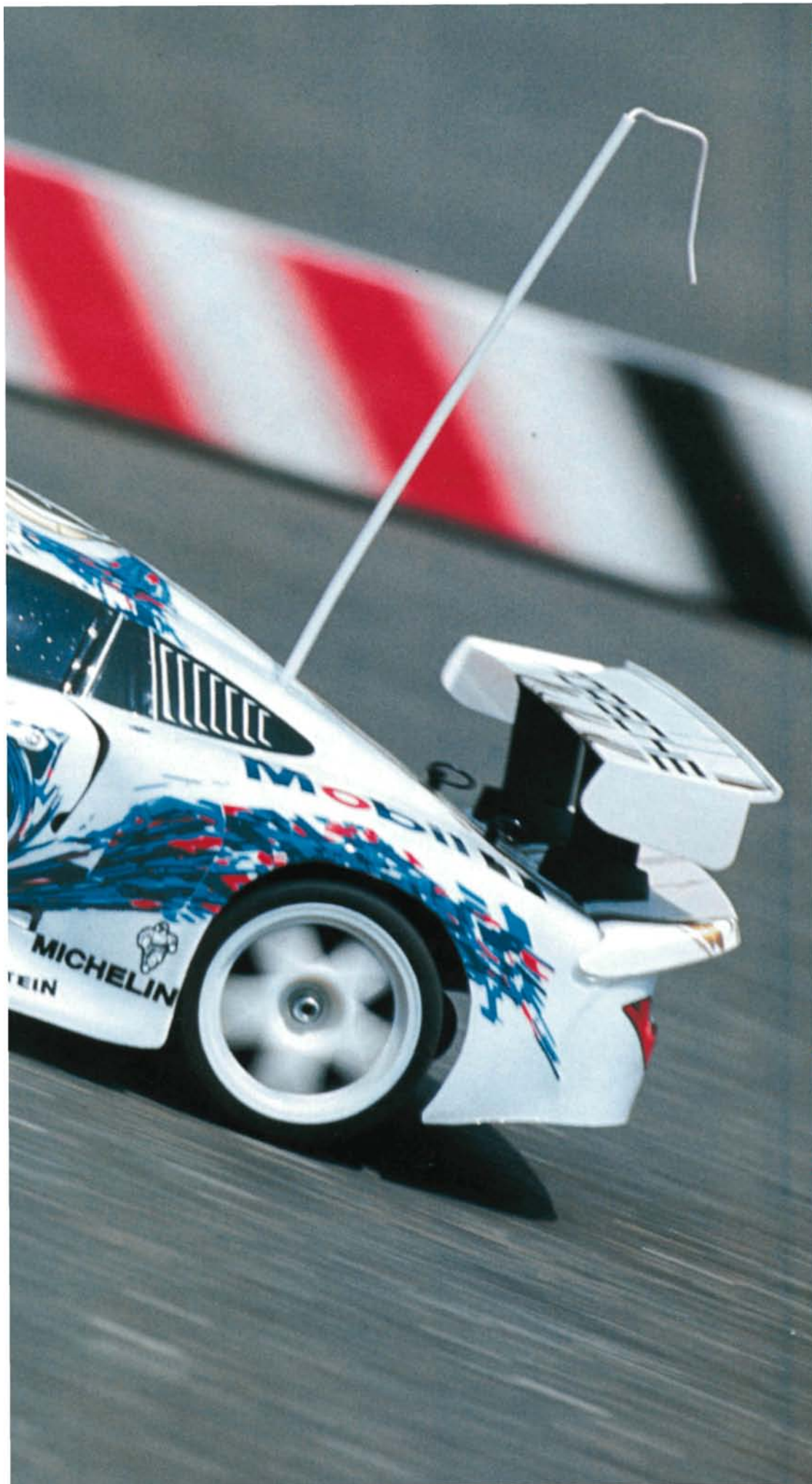
# Megatech Nitro Pro 2000

Off-road tech meets on-road  
excitement

by Paul Onorato

**Looking to buy a fun, nitro-powered RC vehicle?** Years ago, choice was limited, so this would not have been a hard decision. Today, the nitro RC car and truck markets have exploded; many manufacturers offer nitro kits for almost every class and in every style, and if you want to get on the track quickly, there are many ready-to-run options. If touring is your style and you're more interested in parking-lot play than high-performance hardcore competition, the Pro 2000 may be your answer for your new nitro RC car. Megatech\* has revamped its original all-wheel-drive nitro touring car with some high-quality new features. Let's take a closer look.





## DATA CENTER

**VEHICLE TYPE** 1/10-scale, 90-percent built, .15-powered, 4WD nitro touring car.

**BEST BUYER** Nitro newcomers and anyone looking for high-speed on-road fun.

**KIT RATINGS** (Poor, satisfactory, good, very good, excellent)

**Instructions** Poor

**Parts fit/finish** Very good

**Durability** Very good

**Overall performance** Good

## SPECIFICATIONS

**SCALE** 1/10

**LIST PRICE** \$309.95

### DIMENSIONS

**Wheelbase** 10.5 in. (267mm)

**Width** 9.25 in. (235mm)

### WEIGHT

**Gross, RTR** 76 oz. (2,154g)

### CHASSIS

**Type** Double-deck

**Material** Aluminum

### DRIVE TRAIN

**Type** 4WD shaft-driven

**Primary** 2-speed clutch bell, 2-speed spur

**Drive shafts (F/R)** Universal drive shafts

**Differentials(s)** Bevel gear

**Bearing type** Shielded ball bearings

### SUSPENSION (F/R)

**Type** Lower A-arm with wishbone upper link

**Damping** Aluminum-body, oil-filled coil-over shocks

### WHEELS

**Type** One-piece plastic

### TIRES

**Type** Rubber street tread

### POWERPLANT

**Engine** SH PT-015C

**Carb** Rotary

**Starter** Pull-starter

**Exhaust** Tuned pipe

## LIKES

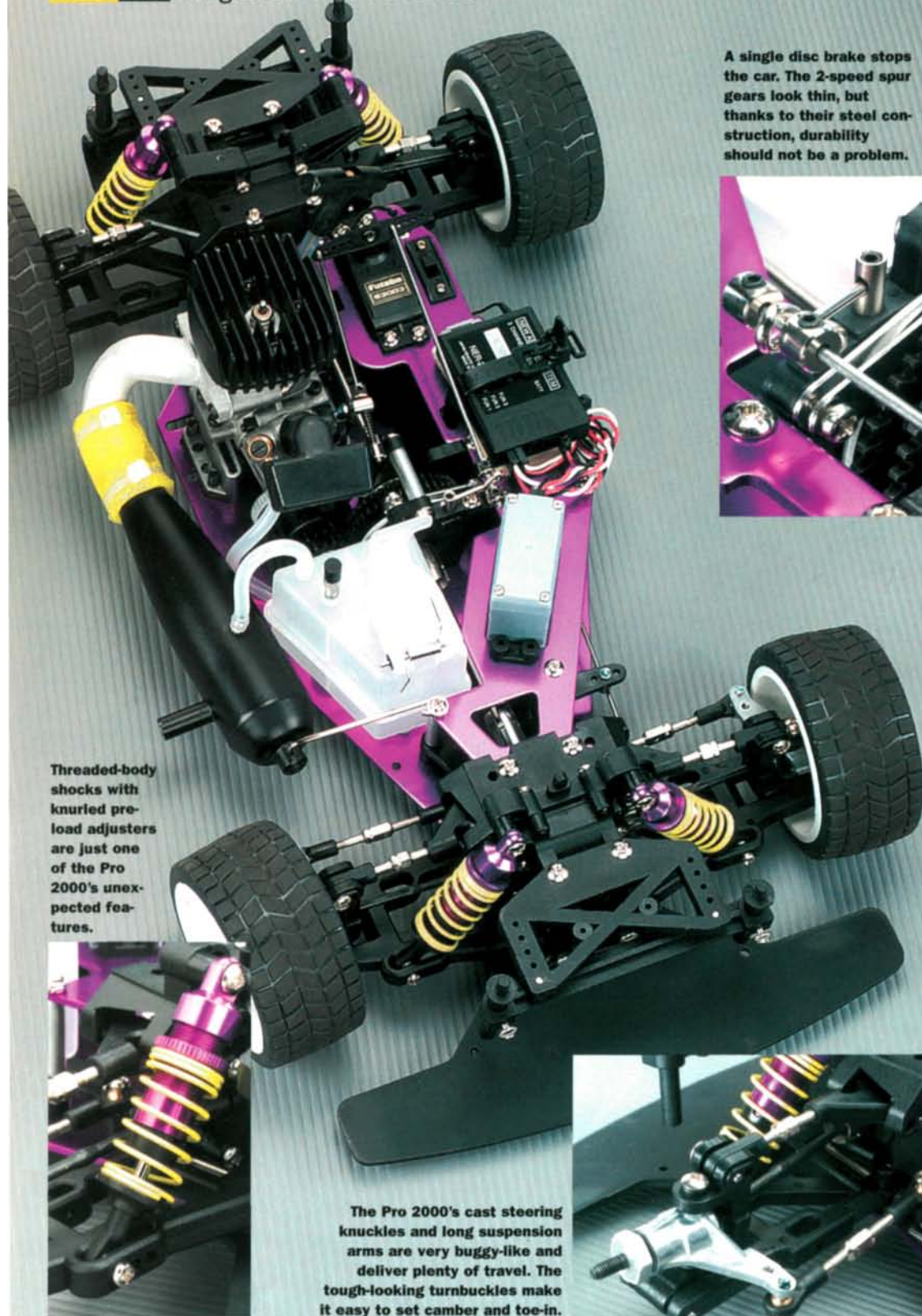
- Awesome top speed.
- Tough construction.
- Loaded with performance parts.
- Comes 90 percent built.

## DISLIKES

- Instruction manual isn't clear.
- Body is out of proportion.
- Glow plug not included.



## TRACK TEST Megatech Nitro Pro 2000



Threaded-body shocks with knurled preload adjusters are just one of the Pro 2000's unexpected features.

The Pro 2000's cast steering knuckles and long suspension arms are very buggy-like and deliver plenty of travel. The tough-looking turnbuckles make it easy to set camber and toe-in.

**YOU'LL NEED** ■ 2-channel radio system with receiver and two servos ■ Batteries for transmitter and receiver ■ Glow plug ■ Glow-plug igniter ■ Fuel ■ Thread-locking compound ■ Enamel paint for side mirrors and rear wing

**FACTORY OPTIONS** ■ Rapid-fire electric starting system—part no. MTC 16500 ■ Vent-flow flywheel—MTC5B003 ■ Pro fuel filter—MTC5Q001 ■ High-performance shock-spring set—MTC13CB-339 ■ Silicone-shock-oil set—MTC123040 ■ Ball-bearing metal servo-saver set—MTC13CB-218 ■ Anti-roll bar set—MTC13CB-361 ■ Impact-absorbing foam front bumper—MTC13CB-340 ■ Pretrued foam tires/wheels (F/R)—MTC13CB-364/MTC13CB-365

## building & setup tips

A single disc brake stops the car. The 2-speed spur gears look thin, but thanks to their steel construction, durability should not be a problem.

Ground-up building instructions aren't included, and the finishing steps shown are "generic" for the Megatech tourers instead of being kit-specific;



unfortunately, the instruction manual I was sent was not as good as the rest of the kit. You'll have to concentrate a little harder than usual to finish the kit, but the manual will get you through. Before you start, read the instructions entirely to become familiar with the car. Here are some tips to help you get the Pro 2000 out of the box and onto the track smoothly.

**Check hardware.** As you would with any RTR RC kit, check all the hardware for tightness, and apply thread-locker to the fasteners that are threaded into metal. Be sure to keep the thread-locker away from plastic; they do not mix. After a day of running, always inspect your car. Glow-engine vibration

loosens screws and nuts, and you will be happy you took the time to secure them.

**Tires.** The tires come mounted and glued on the wheels. Inspect them to ensure they're glued securely

because the sheer speed of this nitro tourer will expose any weak bond.



**Shocks.** The shocks come mounted and filled with oil. Check each by compressing and listening closely for a bubbling sound that would indicate the shock is not entirely filled or has air bubbles trapped inside. If your shocks have air in them, I suggest that you refill each one with 60WT silicone oil.

**Engine.** Read the engine user guide and make the necessary adjustments for break-in before you install your radio. When the receiver has been installed, adjusting the low-speed needle valve can be difficult, but this will depend on which radio you use and how you mount it.

**Fuel system.** The fuel tubing that runs from the tank outlet up to the carburetor inlet comes dangerously close to the flywheel. To remedy this, remove the tubing where it's connected to the carb and twist it slightly. When you reattach the tubing, it will stay clear of the flywheel.

**Body.** The Porsche 911 GT-1 body comes with two sheets of decals, a set of side-view mirrors and a rear wing. With these, you can re-create one of the Porsche GT-1s that raced in the mid-'90s at such races as the 24 Hours of Le Mans. The decals give you the option of replicating car no. 25 or 26. If you are familiar with them, you'll know they have fairly complex but beautiful paint schemes. If, like me, you enjoy creating authentic-looking racecars, I recommend that you do a little research on the Internet to find actual pictures of the GT-1. Unfortunately, the instructions are of no help with authentic decal placement. They contain only two small black-and-white pictures of the Porsche, and the decal positions shown don't replicate the full-scale Porsche GT-1.

## KIT FEATURES

• **Chassis.** The Pro 2000's backbone is a stiff aluminum plate anodized in purple. Like similar nitro tourers, all screws are countersunk, with the exception of the engine hardware. Strategic openings allow access to components such as the steering servo's output shaft and the fuel-tank-outlet nipple. Enhancing rigidity is a purple-anodized aluminum upper deck that houses the radio components. This deck is designed to allow the use of different radio systems and engines with slide or rotary carburetors. Remove nine screws from the upper deck, and the entire radio system is out; this allows thorough chassis cleaning. On the downside, the radio system stays exposed to the elements, but this car is intended for on-road use and probably won't be subjected to that much dirt. At either end of the chassis plate is a hefty gearbox protected by front and rear bumpers. Fully adjustable body mounts are attached to the top of the gearboxes.

• **Drive train.** Power is transferred from the engine to a centrally mounted 2-speed transmission that has a shift-point adjustment that allows you to control when second gear kicks in. The 2-speed's housing shares space with the cam-activated disc brake, and dogbones connect the 2-speed with the front and rear bevel-gear diffs. Universal axles get the power out to the wheels, and a complete set of ball bearings support all of the spinning parts.

I am not totally comfortable with the method used to fix the hex hubs on the axles: they're pressure-fit instead of slotted to lock onto crosspins. You just have to be certain the wheel nuts are firmly screwed on.

• **Suspension/steering.** Megatech kept chassis tuning and durability in mind when designing the suspension. The sharp-looking purple-anodized aluminum shocks were among the first chassis features I noticed. The shock bodies are threaded, include knurled aluminum preload adjusters and come conveniently filled with shock oil. Long lower suspension arms give the Pro 2000 its wide track, and steel turnbuckle upper links support the tops of the hub carriers. The stock setup provides more than an inch of shock travel; down-travel can be limited by adjusting the capscrews in the lower suspension arms. Holes in the top of the gearboxes allow a hex driver to reach the capscrews. A built-in servo-saver is incorporated into the steering bellcranks, and heavy piano wire acts as the drag link between the bellcranks. Steel turnbuckles connect the steering linkage to aluminum hubs.

• **Tires, wheels and body.** The Pro 2000 is offered with a choice of three painted and trimmed bodies: a Porsche 911 GT-1, a Mercedes CLK-GTR, or a BMW M. I used the Porsche GT-1 body for this "Track Test." Constrained by the chassis' wide stance, the body seems out of proportion, so realism is sacrificed.

Nice-looking 5-spoke plastic wheels and street-tread tires with foam inserts help get the Pro 2000 rolling. The wheel color will depend on which body you choose. The CLK-GTR wheels are black, and the BMW and Porsche wheels are molded in white. The tires, rims and foam inserts come mounted and glued. These stock tires are designed for long wear and do not provide the best grip, but they give some fun handling characteristics such as all-wheel-drift through the corners.

• **Engine and accessories.** The included SH PT-015C engine is equipped with a rotary carburetor containing high- and low-speed needle valves and a separate idle screw, so engine tuning shouldn't be a problem. Unfortunately, Megatech does not include a glow plug, and in a kit that comes almost ready to run, this is a glaring omission. A large, finned, heat sink sits atop the motor to dissipate heat. A 3-shoe clutch with a lightweight flywheel is bolted onto the crankshaft, and a pull-starter is attached to the opposite end. Replacing the plastic tuned pipe that came with earlier kits is a metal tuned pipe connected to an aluminum header—both already

## JR® R-756 transmitter and receiver.

This radio has a ton of features, so making adjustments for a nitro car is a breeze. It's easy to find a home for this compact receiver on a chassis.

## FMA Direct® S360 steering servo.

I wanted a servo with a little more power for the steering, especially to control a 4WD nitro vehicle. FMA's high-output servo has two ball bearings to ensure smooth operation, and it boasts 81 oz.-in. of torque.

## Futaba® FP-S3003 throttle servo.

This standard servo performs its throttle/brake functions well. The Pro 2000's brake is very effective and does not require a powerful servo for strong braking action.



## Dynamite® Blue Thunder Race Formula.

I have used this fuel before, and I know it's reliable. I use 20 percent nitro.



## TRACK TEST Megatech Nitro Pro 2000

installed on the engine. A snorkel-type air cleaner with foam insert keeps dirt and debris out of the carb, and a large fuel tank with a built-in primer feeds the engine.

### PERFORMANCE

It was time to test the Pro 2000, and my driveway was the test track for the break-in period. By the third tank of fuel, the SH engine was really picking up speed, and the driveway was too short for the transmission's second gear to kick in. Before packing up and heading to a nearby large, empty parking lot, I decided to run the tank dry, but before it ran dry, I had a problem: approaching the end of the driveway, I came off the gas, and as I rolled back onto the throttle exiting the turn, the engine just revved and the Porsche GT-1 rolled to a stop. I found that the outer pinion gear had fallen off. An E-clip keeps the clutch bell on the crankshaft, but the E-clip's diameter is not large enough to retain the outer pinion gear if it loosens. A larger E-clip could solve this problem. Luckily, with the help of my brother's metal detector, I found the pinion in the grass. While I was replacing the pinion, I took this opportunity to examine the entire chassis for other loose hardware.

Satisfied that no other parts would end up in the weeds, I headed to a parking lot to give the Pro 2000 a chance to fully stretch its legs. After I had adjusted the high-speed needle valve to lean out the engine a little more, the response off the line was quick. Then, as the engine rpm wound up, the second gear was activated and the Pro 2000 took off. It had been a while since I had driven an on-road nitro-powered car, and I was amazed by

its speed—about 40mph. When I came off the throttle to enter a corner, the car started to swerve back and forth. The suspension with the factory-assembled shocks quickly revealed excessive body roll; they weren't stiff enough. For a quick fix while at the parking lot, I cranked down all the preload adjusters. I do plan to replace the stock oil with oil of heavier weight, and I'll go for the optional anti-roll bars, but for the time being, this slight adjustment helps considerably. I ran the Porsche GT-1 wide open down the straight, throttled back and power slid around the turn. This is not an ideal setup for maximum performance, but for fun, it is an absolute blast, and isn't fun what it's all about? I ran tank after tank until the fading light of late afternoon made me call it a day.

### FINAL COMMENTS

The wide track, powerful engine, 2-speed transmission, full ball bearings, turnbuckles, aluminum shocks and the rest of the Pro 2000's equipment result in a nitro car that is fast and easy to drive; and as your skills improve, the fully adjustable chassis can progress with you. That alone is enough to give the Pro 2000 a high rating in my book, but when you add that the chassis comes 90 percent built and there's a choice of three painted and trimmed body styles, that puts it over the top. My only concern is the instruction manual; it could have been clearer, but according to Megatech, this is being corrected as I write. For on-road fun, the Megatech Pro 2000 nitro touring car is a total blast.

*\*Addresses are listed alphabetically in "Featured Manufacturers" on page 216. ■*

**GS STARTER BOXES**  
Part #GSS000011SL (Silver) \$89.99  
(Purple) Part #GS000010PR

**OS .21 ENGINE RZV99B (P)**  
Part #OSMG2064 \$269.99

**Novak**  
CYCLONE \$119.99 Part #1765  
CYCLONE TC \$119.99 Part #1767

**DRCW**  
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**READY-TO-RUN**  
**REPORT**  
1/10-SCALE NITRO & ELECTRIC

# Kyosho Ultima ST EP and GP Readysets

Instant Ultimas with your choice  
of power

by Chris Chianelli and Peter Vieira



**Kyosho** is no stranger to the ready-to-run scene; its Sandmaster and Tracker series of trucks have been available for quite some time, and some of their individual components hearken back to the days of the original Ultima. Kyosho's latest RTRs—or "Readysets," as Kyosho's marketing suits have named them—are also Ultimas, but they're factory-built versions of the new Ultima Type R electric and nitro truck platforms (reviewed in the March and June 2000 issues), and they have most of the features of those modern machines. The Readysset GP Ultima ST and EP Ultima ST also include an installed, all-new Kyosho radio set and factory-painted bodies, so it's easy to get those new truck features onto the track quickly. Let's see just how quickly and how well the trucks work in the dirt.

PHOTOS BY WALTER SIDAS





## DATA CENTER

VEHICLE TYPE 2WD, 1/10-scale,  
ready-to-run stadium trucks

BEST BUYER First-time RC hobbyist

KIT RATINGS (poor, satisfactory,  
good, very good, excellent)  
Instructions Good  
Parts fit/finish Good  
Durability Good  
Overall performance Good

## SPECIFICATIONS

### ELECTRIC ULTIMA

SCALE 1/10

LIST PRICE \$189.99

#### DIMENSIONS

Wheelbase 11.2 in. (285mm)

Width (F/R) 12.25/12.5 in.  
(311/317mm)

#### WEIGHT

Gross (as tested) 56 oz. (1,583g)

#### CHASSIS

Type Semi-tub

Material Plastic

#### DRIVE TRAIN

Type Gearbox

Primary Pinion/spur

Drive shafts Dogbone

Differential(s) Bevel gear

Slipper clutch None

Bearing type Bushings

#### SUSPENSION (F/R)

Type Lower arm/upper link

Damping Plastic-body oil-filled  
coil-over shocks

#### WHEELS

Type White, 2.2-in. dish

#### TIRES

Type Ribbed/mini-spike

#### ELECTRICS

Motor 540

Battery (not included) DuraTrax\*

RC-2400 6-cell pack

ESC Mechanical

### GAS ULTIMA

SCALE 1/10

LIST PRICE \$309.99

#### DIMENSIONS

Wheelbase 11.2 in. (285mm)

Width (F/R) 12.25/12.5 in.  
(311/317mm)

#### WEIGHT

Gross (RTR) 66 oz. (1,871g)

#### CHASSIS

Type Stamped plate

Material Aluminum

#### DRIVE TRAIN

Type Gearbox

Primary Clutch bell/spur

Drive shafts Dogbone

Differential(s) Bevel gear

Clutch 2-shoe centrifugal

Bearing type Bushings

#### SUSPENSION

Type (F/R) Lower arm/upper link

Damping (F/R) Plastic-body  
oil-filled coil-over shocks

#### WHEELS

Type White, 2.2-in. dish

#### TIRES

Type Ribbed/mini-spike

#### POWERPLANT

Engine Kyosho GX-15 pull-start

Carb Single-needle barrel

Pipe Muffler

Fuel 20% DuraTrax Red Alert (not  
included)

## LIKES

- Same essential design features as race-ready "Type R" Ultimas.
- Attractive decal sets, painted and trimmed bodies.
- High-quality radio equipment.

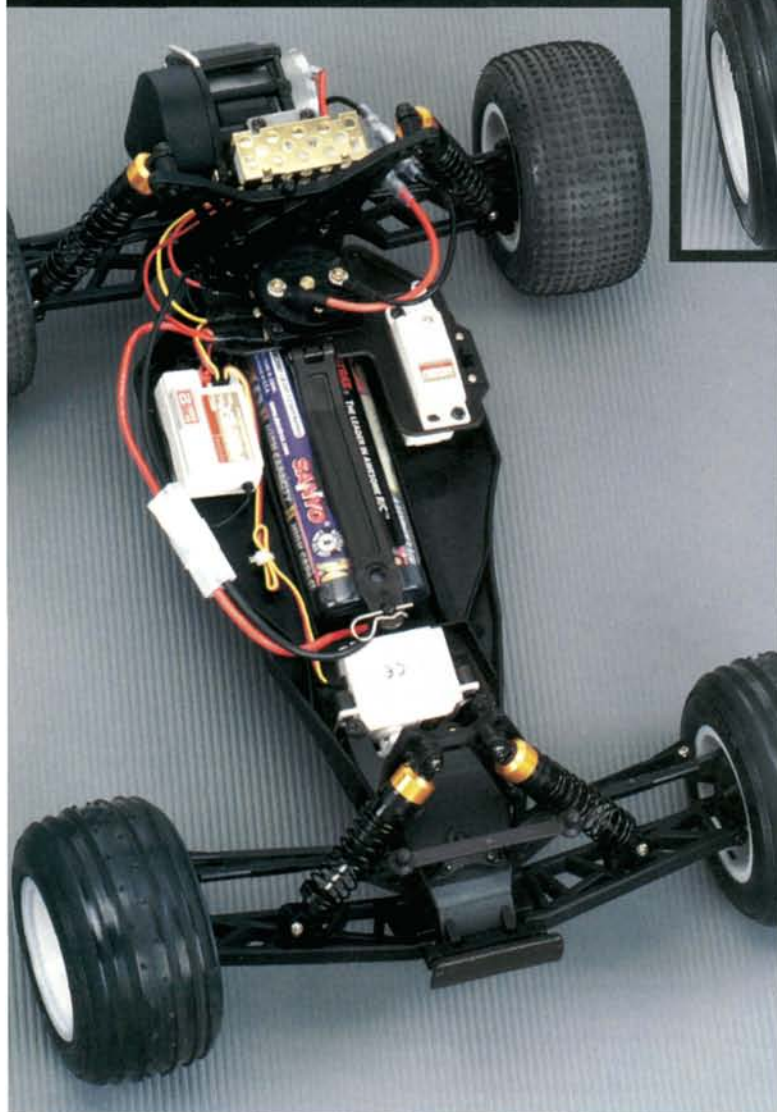
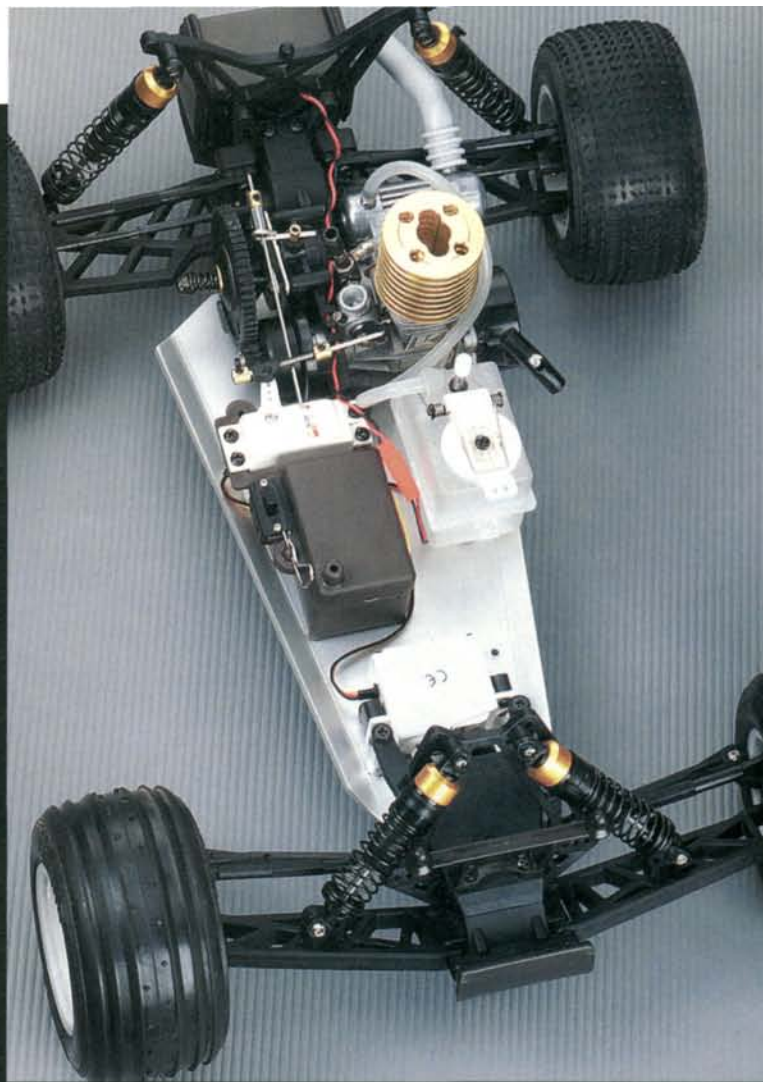
## DISLIKES

- EP Ultima is not equipped with a slipper clutch.
- "Type R"-style radio tray and fuel tank aren't used with Readysset GP Ultima.
- Readyssets' wheels can't be swapped for those of "Type R" Ultimas or other brands of popular off-road wheels.





Kyosho's GX-15 engine is easy to start and reliable—the perfect beginner setup. A tuned pipe is a wise hop-up, but the stock muffler won't reduce performance below any first-time driver's performance expectations.



A plain ol' 540 motor powers the EP Ultima and favors long run times over tire-spinning acceleration. Still, the top speed isn't bad for a 540-powered truck, and a machine-wound modified is an easy, inexpensive upgrade if you just have to go faster.



**YOU'LL NEED** EP Ultima: ■ 6-cell battery pack w/Tamiya connector ■ Battery charger ■ Transmitter batteries  
GP Ultima: ■ Transmitter and receiver batteries ■ Fuel  
■ Glow starter



## VEHICLE FEATURES

Both the EP and GP have:

- **Oil-damped shocks.** The Ultima's plastic-body shocks have gold-anodized aluminum caps and use clip-on preload spacers to adjust ride height. Kyosho includes a full set of spacers to fine-tune the truck to your liking, but the factory settings should be fine for most hack-around surfaces.

- **3-gear transmission with gear differential.** The Ultima's transmission features a classic gear layout with a bottom-mounted differential. The diff uses internal cast gears—two output gears, two spider gears—and spins the rear wheels via dogbone drive axles. Metal bushings outfit all the Ultimas' rotating parts.

- **Fixed camber links and tie rods.** Molded, snap-on camber links are typical of RTR kits, and the Readysset Ultimas use them on all corners. The one-piece tie rods mean that toe-in is fixed; adjustable toe-in is preferable, but the factory angles look OK.

- **Racing-style tires.** Bevel-rib front tires with tiny, widely spaced knobs down the center and mini-block rear tires give the Ultimas a racetruck look instead of a monster stance. The tires are factory-glued to dish rims and use foam inserts to support their relatively soft compound.



We had no problems with the EP's rotary speed control. Nothing beats an ESC, but as mechanicals go, Kyosho's is pretty reliable.

Additional GP Ultima ST features:

- **2mm aluminum chassis.** The GP's stamped-aluminum chassis plate is reasonably stiff thanks to its folded sides, and with the exception of the three engine-mounting screws, screw holes are fully countersunk. The chassis' nose—a separate plastic component—is supported by a short upper deck.

- **Kyosho GX-15 engine.** The pull-starter-equipped GX-15 has a ball-bearing-supported crankshaft, machined heat-sink head and 2-shoe clutch. Like most Kyosho engines, the GX-15's rotary carburetor has a fixed low-end needle. A small, airplane-style expansion muffler and rubber exhaust pipe vent fumes out at the rear of the truck, away from the tires and body.



- **Enclosed receiver box.** A fuel-fouled receiver will almost certainly lead to a runaway truck, but the GP's virtually sealed receiver box will keep the Perflex receiver safe and sound.

- **Slipper clutch and disc brake.** A dual-disc slipper clutch protects the transmission and can help prevent wheelspin on loose surfaces. A single plastic brake disc is keyed to the transmission top shaft and is pinched by steel calipers.

- **Painted, trimmed bodies.** Both Ultimas make use of ample decal sheets to spruce up single-color paint jobs (black for the GP; metallic blue for the EP). The bodies are trimmed at the factory; just pop out the fender wells, peel off the protective film and apply the decals.

Additional EP Ultima ST features:

- **Molded chassis.** The EP's chassis is a clone of the Ultima ST Type R's, but it seems to be made of a more flexible plastic. This can only increase the truck's durability.

- **3-step mechanical speed control and 540 motor.** These are old standbys for Kyosho; the "sealed" Mark II speed control gives the EP reverse capability, and the 540 motor should provide plenty of run time and acceptable beginner speed.

## IN THE BOX

- **Kyosho Perflex transmitter and receiver.** This is Kyosho's first transmitter since the Pulsar, and it's a good one that's worth transferring to other vehicles down the road. Big-grip fans will especially like it, since it stows its batteries (not included) in the handle. Three LEDs indicate battery status, analog trim knobs are turned easily but stay put, and a thumbwheel easily makes steering-rate changes on the fly. The Perflex also has a broad foot, so it will stand easily.

- **Perflex KS-201 servos.** Both trucks are equipped with two servos. Although "standard" servos such as the KS-201s are generally considered to be too weak to steer trucks, they function satisfactorily for the sort of backyard action the Readysset trucks are most likely to see.

## PERFORMANCE

Whenever an RTR electric kit comes to the office, its first test is usually a blast up and down the hallway. The EP Ultima ST was no exception; minutes after opening the box, Chris was speed-testing the truck on the carpet and doing reverse-to-forward wheelies. I had the bright idea of using a bulletin board as a jump and quickly propped up a box to transform the corkboard into a ramp. The truck launched a good 12 to 15 feet with about 4 feet of



The Perflex radio is a keeper. We weren't too jazzed on the receiver's and servo's white cases, but they worked well.



Sealed receiver and battery boxes aren't a license to run through puddles, but they will help prevent the radio gear from getting fouled by mud, water, or fuel.



Both Ultimas are sprung by plastic shocks that are factory-filled with oil and bladder-equipped. The gold-anodized caps are a nice touch.



air, so I thought it would be cool to have Chris jump the truck over me. Then everybody had to take a turn! The EP Ultima took the jumping in stride until a nasty tail-first landing popped the tranny's idler gear and sidelined the truck for the day. It didn't help matters that the truck landed perpendicular to the ground so the suspension was prevented from cushioning the landing, and all those wheelies may have helped overtax the gear, but a slipper clutch could have helped us avoid the breakage. I'd like to see one included in the kit.

Since the EP truck was done for the day, we quickly moved on to the GP. Chris actually hit the racetrack (Xtreme RC, New Milford, CT) with it, and after running it through a break-in period and a few hot laps, he voiced the opinion that the canister muffler was robbing the engine of power. It was—they all do—but the engine's reliability and easy starting outshone Chris's disappointment with the muffler. Yes, you can get more power and a snappier throttle response with a tuned-style pipe, but nitro newcomers will not be disappointed with the kit as is. As for handling, the kit tires didn't hook up well on Xtreme's soft, silty surface, but a tire change wasn't possible because of the truck's hex rims (which are also used on the EP version). Unlike the Ultima Type Rs, which accept Losi and Associated wheels, the Readysets must use Kyosho rims.

Chris's testing moved to the grass and parking lot, where the tires delivered plenty of traction for the playing-around driving we all like to do, which is really what the Readysets are meant for.

## FINAL ANALYSIS

Both Readysset Ultima STs are good trucks, but a few changes could make them great. I would like to see a slipper clutch included as standard equipment on the electric truck; I know how tough Kyosho trannies usually are, and I'm confident a slipper would have spared us a broken gear. Both trucks should also be more compatible with the Ultima ST Type Rs as well as the rest of the RC "world." For example, we tried to swap transmissions between the EP Ultima Type R and the Readysset version, but the trannies are not interchangeable. The next step was to try to swap the gears from one tranny to the other; no go there, either. Rims are the big issue; why do the Readyssets include unusual hex rims instead of the industry-standard crosspin rims used with the Type Rs? On a related note, why use a different upper deck and fuel tank on the Readysset GP from the Type R GP?


These criticisms address the Readyssets as upgradable platforms, but we can't forget that most buyers will simply have fun and run the wheels off them without any thoughts of racing or upgrades (except for a bearing set or a hotter motor, maybe). As pure fun-run machines, the Ultimas are well put together and easy to drive, they have high-quality radio systems and attractive bodies and graphics. While it's tempting to rate the trucks according to a note-for-note comparison with the racing Ultimas, the true test of the Readyssets is their ease of operation and fun factor, and both trucks score well there.

\*Addresses are listed alphabetically in "Featured Manufacturers" on page 216. ■

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**TRACK  
TEST**  
1/10-SCALE ELECTRIC

# Tamiya TB-01 Mitsubishi Lancer

Testing Tamiya's shaft-driven,  
go-anywhere rally car by Doug Huse



PHOTOS BY WALTER SIDAS



## Are you tired of looking for that perfect piece of asphalt?

Had it with driving around aimlessly, hoping that a shopping center somewhere has decided to repave its parking lot? Do thoughts creep into your mind about giving up your touring car for some dirt-slinging, off-road action, but you hate to give up scale looks and performance? Then Tamiya has the answer for you: the all-new TB-01 4WD rally-racing chassis—touring-car looks combined with a chassis specifically designed for off-road use. Turn the page to find out all about this new, dirt-burnin', power-slidin', all-terrain machine from Tamiya!



### DATA CENTER

**VEHICLE TYPE** 4WD, electric,  $\frac{1}{10}$  rally car  
**BEST BUYER** Enthusiasts who are looking for an all-terrain vehicle with a sedan-type profile.

**KIT RATINGS** (poor, satisfactory, good, very good, excellent)  
**Instructions** very good  
**Parts fit/finish** very good  
**Durability** very good  
**Overall performance** good

### SPECIFICATIONS

**SCALE**  $\frac{1}{10}$   
**STREET PRICE** \$185

**DIMENSIONS**  
**Wheelbase** 10.125 in. (257.175mm)  
**Width** 7 in. (177.8mm)

**WEIGHT**  
**Total, as tested** 62.72 oz.

**CHASSIS**  
**Type** Tub  
**Material** Plastic

**DRIVE TRAIN**  
**Type** Shaft  
**Primary** Pinion/spur gear  
**Drive axle** Steel dogbone  
**Differential** Gear  
**Bearing type** Oilite bushings

**SUSPENSION**  
**Type** Lower A-arm w/adjustable upper link  
**Damping** Oil-filled damper w/coil-over spring

**WHEELS**  
**Type** Racing dish

**TIRES**  
**Type** Block tread

**ELECTRONICS** (not included)  
**Transmitter** KO Propo EX-11 Presto  
**Steering servo** Futaba S148  
**ESC** Novak Fusion  
**Motor** Stock 540  
**Battery** Trinity Ex-Tech 2000

### LIKES

- Exceptionally high-quality body/interior set.
- Well-designed dust seals and inner body keep dirt out.
- Super-tough gear diffs.
- Tons of Tamiya upgrades are available.

### DISLIKES

- Bushings.
- Foam tire inserts are not included.
- Steel center drive shaft is very heavy.





The TB-01's steering system is buried in a foam block; this prevents harmful dirt and debris from entering the chassis. To allow the steering components to pivot freely, the foam is precut.



Tamiya has included adjustable turnbuckles with the new TB-01; this allows you to make fine-tuning adjustments and is very beneficial when you make ride-height changes.

The motor is also sealed off with self-adhesive foam. When we had finished running the car on a dry baseball field, the inside of the car still looked brand new.



## building & setup tips

The following tips will help you through the steps indicated. If you take your time, you can expect an easy, fun build!

**Steps 6 and 11.** Although the instructions say to grease the end of the shaft when you install the dogbones, do so very sparingly. Excess grease will attract dirt, which can wear out the shafts prematurely.

**Step 14.** Attach the tie rods and steering link to the bell-crank before you install the assembly in the chassis. The ball links fit tightly, and once the assembly has been placed in the chassis, there isn't much room for pliers.

**Step 16.** I highly recommend that you use a switch cover when you install the switch in the stock chassis location, since it does point straight down to the ground. I used a Kyosho switch boot (part no. BS-79).

**Step 18.** Even though the gears will be covered, use grease very sparingly on the gear set. If you are not going to use the included motor, or your speed control does not have bullet connectors, you will need to solder the bottom motor wire before the motor is installed in the chassis. The top wire can be soldered after installation, but you might as well install it while the motor is out of the car.

**Step 25 and 26.** Once the shocks have been installed, you cannot reach the body-mounting screws, so do the mounts first.

**Step 30.** The driver set requires the use of enamel plastic-model paints. For authentic-looking fabric, use flat colors for the clothes; use glossy colors for the helmets.

**YOU'LL NEED** ■ 2-channel radio system ■ Battery ■ Charger ■ Polycarbonate-compatible paint ■ CA glue for the tires ■ Steering/throttle servos

**FACTORY OPTIONS** ■ Stabilizer set—part no. 53354 ■ Ball-diff set—53360 ■ Aluminum steering set—53365 ■ Aluminum gearbox mount—53366 ■ Aluminum front suspension arm (F/R)—53372/53373 ■ Reinforced propeller shaft—53381 ■ Turnbuckle tie-rod set—53388 ■ Turnbuckle upper-arm set—53392 ■ Aluminum rear upright—53380 ■ TB-01 bearing set—53398 ■ Aluminum kingpins—53157 ■ Universal shaft set—53115 ■ Aluminum super low-friction shocks—53280 ■ Aluminum servo mount—53308



## KIT FEATURES

• **Chassis.** The TB-01 chassis is a one-piece design with molded-in partitions and strengthening gussets. The radio gear and motor go on the left; the right side is reserved for the battery pack. This arrangement nicely balances out the chassis. To help avoid hang-ups, all of the screws on the underside are either recessed or countersunk. To further help get over rough terrain and protect the chassis' underside, the front and rear bumpers also serve as skidplates. Up top, the chassis features front and rear spur-gear and steering-linkage covers. These, combined with the included "dustproof sponges," do an excellent job of keeping dirt and debris out of essential working areas. And even though the tub design is quite strong "as is," Tamiya added an upper frame rail that runs the length of the chassis and ties the upper covers together to further enhance structural integrity.

• **Suspension and steering.** Front and rear lower arms are the traditional Tamiya, two-piece, screwed-together design. The upper links are adjustable—a nice departure from Tamiya's more common, molded, one-piece link.

Shocks are molded-plastic-body units with double O-ring shaft seals and a bladder-type seal up top. The shaft and piston are a one-piece unit that reduces parts count as well as assembly time yet still allows adjustability by using shock oils of various weights. The lower arm has one mounting position, and the upper shock has two. Steering consists of Tamiya's molded-plastic, super-beefy, I-dare-you-to-try-and-break-me bellcrank design with adjustable tie rods.

• **Body, tires and wheels.** I won't ramble on about how great Tamiya body and sticker sets are, 'cause I'm sure you already know that! What I will tell you is that Tamiya has gone the extra mile with this one and included an interior set as well as an inner cover that is attached to the chassis with Velcro®-brand fastener to further seal out dirt and debris. With its aggressive tread design, the tire-and-wheel package included with the car screams "Take me off-road!" I feel I must give Tamiya a rare points deduction for not including any inner tire foams, however; the tires are a bit too flexible and bouncy for my taste.

• **Driveline.** At first glance, the drive train seems to have been taken directly from the TG10 chassis. On closer inspection, it is apparent that though some TG10 components have been used, the drive train has been redesigned to better suit the TB-01's mission as an electric-powered, on-road/off-road machine.

The included stock 540 motor is mounted longitudinally on the left rear of the chassis. As usual, Tamiya has included a mount with bolt-together, no-fuss, gear-backlash settings. Just choose one of three included spur gears, use the chart in the manual to match a pinion to it, and bolt the motor into the appropriate mounting holes. Gearing options range from a low 9.91:1 (included) all the way down to a

fast 5.72:1. The spur and pinion gears are protected from dirt and debris by a tightly fitting cover on top and a sponge seal along the bottom.

The spur gear is pinned to the heavy-duty (and it is, literally, *heavy*) center drive shaft that runs the length of the chassis and drives the front and rear diffs directly. The differential assemblies are typical Tamiya bulletproof cast-metal gear units that are identical front and rear. The usual composite steel and plastic dogbones link the diff outdrives to the wheel axles.

Except for the included ball bearings on the outdrives of the diffs, all rotating shafts and axles are supported by plastic or bronze bushings.

The finishing touch is an included machined-aluminum clip on the motor heat sink—a much-needed accessory, as it can get a bit warm in the enclosed chassis.

## PERFORMANCE

As always, the best part of any review is takin' it to the streets—or in this case, the dirt lot, or maybe the beach; or why not the baseball diamond at the park? This is a rally car, and rally cars are meant for all-terrain running.

With a freshly charged stick pack tucked away in the chassis and the body sealed up nice and tight, the time had come to give it a run. As is usually the case with Tamiya cars, the chassis felt nice and tight, and it tracked straight and true. The included gearing allowed plenty of torque for those dirt-kicking burnouts and moderate power slides through the turns. The chassis reacted very well to being kicked around off-road; the suspension and shocks did a really nice job of handling the rough terrain. The included 540 motor does, however, fall a bit short when the car hits the pavement. Though it has plenty of off-the-line acceleration, top speed is just not there. This can easily be rectified by installing one of the many available aftermarket motors; I used a Trinity P2K. With the stock gearing setup, the chassis really woke up! The car possessed tons of donut-producing power and more than enough top speed. The added power made the car much more of a joy to toss around in the dirt.

After all was said and done, it was time to look under the inner body. Everything worked the way it was supposed to. The inner chassis was clean; only a bit of dirt had intruded. The only problem with a seal this tight is that the motor tends to get a bit hot, even with the included heat sink. It's absolutely necessary to cool down between runs.

## OVERALL

Tamiya has once again put together a great package. The TB-01 is definitely a "take it and run it anywhere" kind of car. Whether it's at the beach, the park, or the parking lot next door, the TB-01 is at home wherever there is open space.

\* Addresses are listed alphabetically in "Featured Manufacturers" on page 216. ■

## KO Presto Radio

The KO\* Presto is packed with features such as multiple-model memory, end-point adjustments and an easy-to-read digital display. You don't need a radio as fancy as the Presto to have fun with the TB-01, but once you've been spoiled by a high-quality FM radio system, it's difficult to go back to budget AM systems.



## Futaba S148

This standard Futaba\* servo provides enough steering for a fun car such as the TB-01. I use these servos on most of my "play" cars because they are reliable and inexpensive.

## Novak Fusion ESC

Any ESC is better than an MSC. I chose a Novak\* Fusion because it's inexpensive, reliable, smooth and very efficient. With its One-Touch Set-Up button, this ESC is very easy to use.



## Trinity EX-Tech 2000 pack

With a fun rally car such as the TB-01, I wanted to get as much run time as possible and still have lots of punch. I dropped in a Trinity\* matched 2000mAh pack for all of the above.





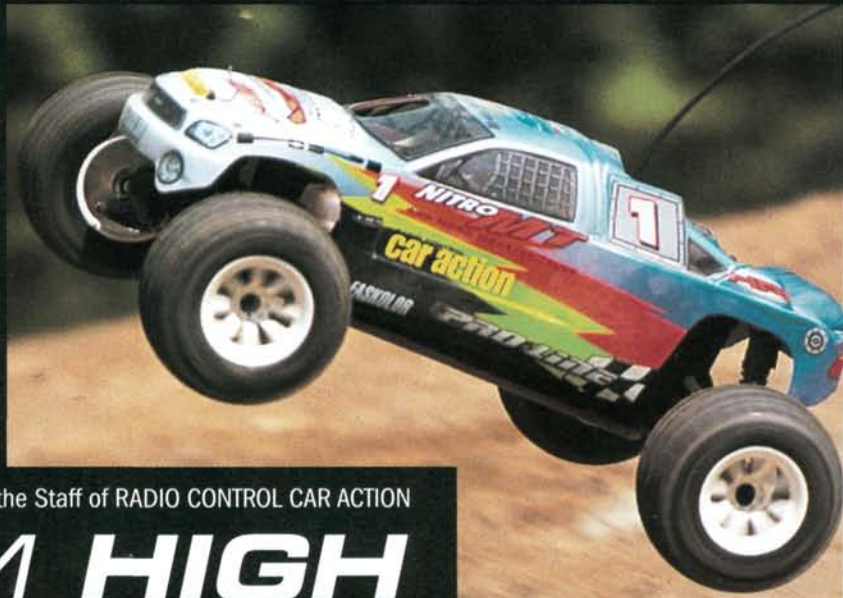
The  
Total  
Guide to

# Big Air

**W**hat drew you to this hobby? Twenty bucks says it was off-road action in general and jumping in particular. Join the club; everybody likes to get air, and any time an activity allows people to leave the ground and return (relatively) safely, they will try to see how high they can go. Just look at motocross, dirt jumping, snowboarding, in-line skating and other—dare I say it—"extreme" sports; if it can be launched, people are gonna go big. RC is no different; everybody likes to sky their stuff. And the cool thing is, you'll never get hurt no matter how hard you biff! To satisfy your (and our) need for big-air thrills, we built some trick trucks just for jumping, put together a few tips to help you get off the ground, and cut out of work early to stage a jump fest for the camera; hope you like it.







by the Staff of RADIO CONTROL CAR ACTION

# HANG 'EM HIGH

## WAGON HO!

Kevin made the mistake of taking his Project Inferno MP-6 (featured in the last issue) to the photo shoot for a few "fun laps." OK, Kev, here's a fun lap for ya: how 'bout you jump your buggy over a station wagon? We salvaged a piece of plywood and a couple of 4x4s from a pile of junked lumber and propped up a ramp. The pictures tell the rest of the story, but what they don't show are the other 12 or so successful 33-foot launches Kevin made over the big rig—without breaking anything! We don't suggest you jump your own vehicle (RC or full-scale) with a similar stunt, but it does make a cool picture.

PHOTOS BY WALTER SIDAS







## HPI RS4 MT

From the start, we knew we would include an HPI MT in this article, but we couldn't decide which to build—nitro or electric. So we built both! Knowing the kind of big hits the truck would have to take, we thought the black-and-blue theme was appropriate.

### PARTS

#### HPI

RS4 MT Universals  
Graphite chassis brace  
Super Shocks  
Graphite rear shock tower  
Heat-sink motor plate

#### RPM

Heavy-duty ball cups

#### Factory Team

Titanium turnbuckles

#### Team Losi

Step-Pin tires, red compound

#### Top

Aluminum hubs, hub carriers, and rear bulkheads

#### Pro-Line

Agitator rims

#### Take-Off

Blue-anodized cap washers

#### GS Racing

Blue-anodized concave washers and nuts

### MODIFICATIONS

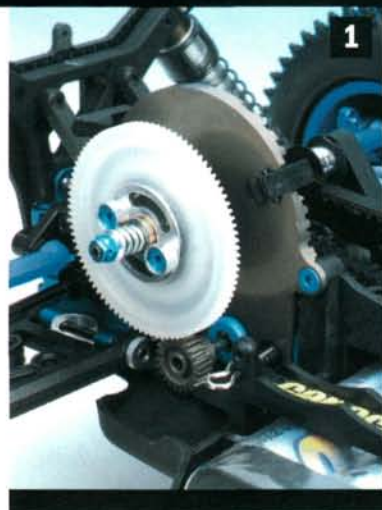
• **Chassis.** Stock plastic all the way here, with the addition of HPI's carbon-fiber upper brace. We set up the chassis for stick packs, since hard-wiring saddles in the field is a huge pain. We also installed a graphite rear shock tower on top of the stock plastic tower to help avoid breakage in a tail-first landing (and it looks trick).

• **Suspension.** Like the Nitro MT, the RS4 MT got the boiled-arm treatment. HPI Super Shocks replace the plastic stockers, and a full set of aluminum hubs, hub carriers and rear bulkheads just about guarantees that suspension failure will not sideline this rig. Factory Team\* titanium turnbuckles and RPM\* ball cups enhance strength and keep the blue motif happening.

• **Drive train.** We fitted HPI universals front and rear, and Robinson Racing\* Absolute gears replace the HPI originals. (There wasn't anything wrong with them, but hey, this is a project truck!) We also added HPI's heat-sink motor plate.

• **Electronics.** A tiny Keyence\* A-01R reversing ESC feeds the juice of a Trinity 1700mAh stick pack to a Trinity Speed Gem Sapphire motor (that's a 17-turn for those of you who aren't Gem savvy). The ESC's 1980s-lookin' Day-Glo wires weren't jibing with the black-and-blue look, so we went for all blue wiring and even dyed the Deans\* connector black. An Airtronics\* 94537 servo and KO Propo\* Mars radio control it all.

• **Body, wheels and tires.** Yet another truck with Agitator-for-Traxxas rims, but we dyed them blue this time. Team Losi\* rubber gets this MT hooked up with step-pins all around, and an HPI Dodge body (minus interior shell) is the finishing touch.



1



2



3

1. The cap washers are from Take-Off, the screws are from GS Racing, and the gears are from Robinson. We don't fool around! That's HPI's heat-sink motor plate behind the gear. 2. More Top\*, RPM and Factory Team stuff beefs up the front end. What you can't see is the increased flexibility we boiled into the front arms.

3. Note the doubled-up rear shock tower, Top bulkheads and hub carriers, HPI universals, Factory Team tie rods and RPM ball cups. Strength!



# DuraTrax Maximum MT

A lot of these Maximum trucks are running around, and we're sure they're getting jumped and taking some lumps.

DuraTrax® has a line of parts to beef up your Max, and they happen to be perfect upgrades for our "Big Air" project. But we didn't stop with DuraTrax stuff, of course; check it out.

## MODIFICATIONS

• **Chassis.** We made a style upgrade with DuraTrax's optional purple chassis, but the stock wire chassis brace wasn't making it. We installed a huge tie-rod brace that we took from an aftermarket Clod Buster chassis kit. You could make a similar brace by using aluminum tube over a threaded rod and a couple of Rocket City® ball ends. We bolted a Kyosho® fuel tank in the center of the chassis just for fun, and a Pro-Line® Chevy Silverado completes the package.

• **Suspension.** DuraTrax's "No breakage" guarantee on the Max's molded parts suggested we could leave the stock pieces in place, but after getting a look at the new optional purple aluminum suspension arms, we decided they were must-haves. The original shocks work great and probably could have handled the abuse we had planned, but we selected a set of long Traxxas® Big Bore fronts and extra-long rears because they have more travel. We built the shocks with 2-hole pistons and 45WT oil with Traxxas black springs. We had to add about six O-rings to the outside of the shaft to prevent the axle from hitting the out-drive when the truck bottoms out. Trinity shock standoffs space the tops of the shocks from the towers.

• **Drive train.** The tranny and drive axles remained largely unchanged, but a Trinity® aluminum brake adapter and slipper plates have been added. DuraTrax's optional steel main gear is also a good idea, but we couldn't get one in time for the launch party, so we settled for the stock plastic unit.

• **Electronics.** Futaba® gear was selected to control the truck. A standard 148 servo takes care of the throttle, and a 9304 servo bolted to the chassis with Trinity servo mounts steers the Max. A 3PDF radio system and DuraTrax 5-cell receiver battery complete the package.

• **Engine.** An O.S.® CV topped off with a DuraTrax heat-sink head replaces the stock Torq .12 engine, and the lame airplane-style muffler was tossed away in favor of a Paris® tuned pipe. A Kyosho header made the quick transition around the engine to keep the exhaust system in close to the chassis so the body would fit. The pipe and header are held together with a GS Racing® coupler.

• **Body, wheels and tires.** Stock rubber and rims all around; they come glued, and nothing else fit! The body is a Pro-Line Silverado.



1



2



3

**1. A heavy-duty brace stolen from an aftermarket Clod Buster reduces chassis flexing in the rear of the Max. 2. Aluminum arms were used up front, too, but they weren't a perfect fit. We had to add a spacer in front of the bulkhead to shim the arm forward. If you don't add the spacer, the arm will slide back and forth. 3. The rear plastic arms were replaced with aluminum units. Traxxas Big Bore shocks damp the landings. Notice the O-rings used as travel stops.**

## PARTS

### DuraTrax

Purple chassis  
Purple aluminum front and rear suspension arms  
5-cell receiver pack

### Traxxas

Big Bore long and extra-long shocks

### Trinity

Shock standoffs  
Servo mounts  
Slipper plates  
Brake adapter

### RPM

Ball cups  
Spring perches  
Preload clips

### O.S. Engines

.12 CV

### Paris

Turbo Ring pipe

### Kyosho

Manifold  
Fuel tank







## HPI Nitro MT

HPI\* has plenty of hop-up parts planned for this truck, but at press time, parts were scarce. No problem; RS4 goodies that will fit are already in the pipeline from other manufacturers.

### PARTS

**HG**  
RS4 rear hub carriers

**MIP**  
Shiny CVDs (F/R)

**O.S. Engines**  
.12 CV

**O'Donnell**  
Heat-sink head

**RPM**  
4-40 ball cups

**Pro-Line**  
Agitator rims  
Dirt Works tires

**Take Off**  
Purple-anodized cap washers  
Purple-anodized self-tapping screws

**GS Racing**  
Fuel line  
Purple-anodized concave washers

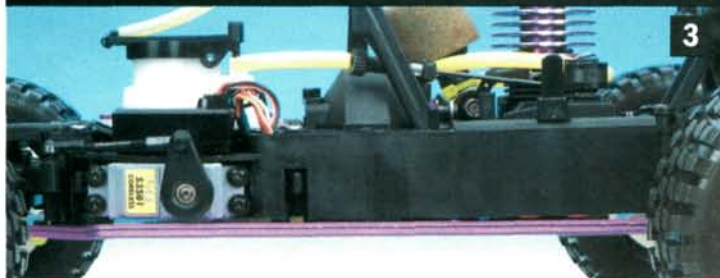
**Alien**  
Engine mounts  
Lightweight flywheel

### MODIFICATIONS

- **Chassis.** Since we planned an engine swap, we needed HPI's optional chassis. We noticed it was no thicker than the stocker, so we decided it would be much more interesting to bolt both chassis together for extra strength.
- **Suspension.** As HPI suggests, we boiled the suspension arms to make them more flexible. We went ahead and boiled the shock towers, too. The rear hubs are Hammad Ghuman\* (HG) units anodized in purple to match the rest of the parts on our Jump MT. Lunsford\* tie rods and RPM ball cups make sure the camber links aren't weak links.
- **Drive train.** The Nitro MT uses a shaft-drive system that is plenty strong, but we decided to change to MIP\* shiny CVDs up front to get rid of the dogbone chatter when steering. We also replaced the rear bones with CVDs to make the truck bombproof.
- **Electronics.** Pete reviewed the MT in the July issue, and we left his electronic gear in place. An FMA Direct\* S3501 coreless servo steers with authority, a standard Futaba S148 handles throttle and brake, and a Futaba 3PDF controls it all.

• **Engine.** The Nitro MT's stock engine was torn down for a rebuild and waiting for parts, so we installed an O.S. .12 CV. It features a Purple O'Donnell\* heat-sink head for improved cooling. Engine guru Steve Pond went to town porting and polishing it, so we know it's fast. An Alien Racing\* lightweight flywheel lets the engine come up to speed quickly, and the engine is bolted down with Alien engine mounts.

• **Body, wheels and tires.** We ran the stock MT body and added Pro-Line Dirt Works tires and Agitator rims (once again, these are meant to fit Traxxas trucks, and we used "front" rims on all corners).



1. To strengthen the rear suspension, we used HG hubs and Lunsford titanium tie rods with RPM ball cups. MIP shiny CVDs ward off tweaking.
2. Here's a close look at the Alien flywheel with the engine mounts peeping out from under the coupler.
3. We went for a double chassis on the "Jump MT." We just lined up their screw holes and bolted 'em together.



## WHAT JUMPS BEST?

We wanted to concentrate on  $\frac{1}{10}$ -scale trucks for this article, but anything off-road can be the basis for a jumping project of your own. These are some of our favorite air machines:

### TRAXXAS T-MAXX AND STAMPEDE



We built a Stampede "jump truck" as part of our 2WD electric monster truck guide published in the March 1999 issue, and it rocked; would you expect anything less from a 10-cell Stampede? With its big tires, long-travel suspension and ample ground clearance, it was a big-sky machine. But the ultimate air machine has to be the T-Maxx; giant rubber, endless suspension and plenty of nitro speed add up to giant jump excitement. Look for a project "Jump-Maxx" soon.

### $\frac{1}{8}$ -SCALE BUGGIES



Quite a few affordable  $\frac{1}{8}$ -scale machines can turn any vacant lot into an off-road playground. The Kyosho Inferno MP-6 Sports could have made the wagon jump as easily as Kevin's "project" car—and for a lot less dough. TTR's Mirage series and the OFNA line of "sport"  $\frac{1}{8}$ -scale buggies are also possibilities. The big buggies are robust, and even "sport" .21 engines produce tons of power. The other bonus is 4WD, which brings us to the next category ....

### ANYTHING 4WD



We built HPI's 4WD nitro and electric MTs because we know how forgiving 4WD vehicles are in the air; with four throttleable wheels, the car's attitude is easy to adjust in flight. Yokomo's MR-4 MT can get some air, too (see the July 2000 issue), and any 4WD buggy will be fun to launch; just be careful of those exposed shock towers.

## BEEFING UP for BIG AIR

In case the shots of our maxed-out project trucks have you worried, we'll clearly state that you do *not* have to go as crazy as we did to have fun jumping your car or truck. Today's RC machines are tough customers, and most can handle a fair amount of abuse without shedding parts. But if you plan to go for really big jumps, it pays to beef up your vehicle's suspension and chassis to cope with the high-impact landings you're bound to inflict on your car or truck. Here's what we suggest:

- **Use stiff springs and heavy damping.** A stiffer suspension setup will launch your vehicle higher and farther by reducing the suspension's ability to "absorb" the jump, and it will take the sting out of hard landings. You'll probably still bottom the chassis out on the huge stuff, but at least you'll soften the blow. If you don't already have a set, upgrade to aluminum-body shocks; some plastic shocks tend to blow their caps on hard landings.
- **Always have "too much" suspension travel.** If your shocks bottom out before the chassis does, you're sure to break arms and hubs or bend axles. The chassis is much more capable of absorbing the blow. You want the chassis to be able to bottom out if the suspension can't fully absorb the impact by itself!
- **Install stronger suspension parts.** Even with the let-the-chassis-bottom-out setup philosophy, the hubs, arms and arm mounts get a real workout. Any aluminum parts or other stronger parts you can afford are welcome here, but avoid molded graphite parts. They're meant to be rigid but are more brittle and prone to breaking when subjected to big-hit abuse. We upgraded to aluminum hubs from Hammad Ghuman on the HPI Nitro MT, and the RS4 MT was given a complete set of hubs, hub carriers and rear arm mount/bulkheads from Top. The MRC Ironman sports heavy-duty plastic rear hubs from RPM (they're meant to fit the Traxxas Stampede and Rustler series but fit the Ironman perfectly).
- **Let the tires take some of the blow.** Tall-sidewall tires will deform more on landing to absorb the impact more effectively. Don't forget to use the foam inserts! We used Pro-Line Masher 2000 and Dirt Works\* treads on the MRC and Nitro MT, while the RS4 MT wears a set of Losi step-pins. We left the stock treads on the Maximum MT.
- **Run a full body.** If you plan to jump a buggy, get a truck body for it. You're almost guaranteed to land your car upside-down at least once if you go for the really huge jumps, and you'll break shock towers if you leave them unprotected by a body.
- **Use plastic or titanium camber links.** Steel links bend too easily. Titanium links from Factory Team or Lunsford are just about break-proof. In a crash, one-piece plastic links will flex or pop off the ball studs, but either is better than breaking (Traxxas guys: RPM makes extra-strong plastic links for your trucks). On our trucks, we ran titanium rods with heavy-duty RPM ball ends. If you can spare a few more dollars, titanium ball studs are an excellent addition that will make your rig virtually crash-proof.

## Jumping your car without junking your car

Sending your RC vehicle skyward is easy, but if you don't know how to control it during a jump, there's a strong chance you'll be taking it home in a Ziploc bag. Here's what really happens when your car leaves terra firma—along with a few tips to minimize the risks of flight.

### • THE TAKEOFF

Always hit the jump "squared up." If you hit the jump at an angle, your vehicle will get squirrely and list to one side in the air, and this will lead to a potentially hub-busting, axle-bending one-wheel landing (at best). Hit the jumps straight on, and you're halfway to a successful launch.

### • IN FLIGHT

Once your car has left the jump, its attitude is determined entirely by throttle input and the inertia of the tires. It's easy to see how this works if you hold your car or truck in the palm of your hand, letting the wheels hang off at either side. If you blip the throttle, you'll feel the rear end try to drop (don't drop your car!). Let the tires spool up, then nail the brake; now, the front end will drop. What you feel is expressed by Newton's third law: every action has an equal and opposite reaction. The classic example of this is jumping to shore from a rowboat. Your action (jumping to shore) has an equal, opposite reaction (the rowboat moves away from shore). In the case of an RC car, the action of spinning the tires has the opposite reaction of the chassis' trying to spin around the wheels. When the car is in the air, this causes it to rotate around its center of gravity (approximately at the center of the chassis; exactly where varies with vehicle). So what does this mean when your machine is airborne? It's simple: applying throttle after take-off will lower the rear wheels and raise the front wheels, so if you're nose-diving, hit the gas. Letting off the throttle or hitting the brake will lower the front wheels and raise the rear wheels, so if your truck is headed for a tail-first landing, hit the brakes. Ideally, you shouldn't have to do much throttling in the air. Hit the jump at steady speed, then let off just slightly as the rear tires leave the jump; once in the air, the wheels are



unloaded, and they'll spin faster, which will cause the rear end to drop if you don't let off a little. With practice, you'll be able to launch "flat" without fuss.

### • THE LANDING

We haven't finished yet. Landing the vehicle properly will determine whether you'll be taking another trip off the jump or going off to the hobby store for replacement parts. Always try for a flat landing; you want all four shocks and wheels to get a piece of the action so that the landing forces are spread evenly. You should also try to match the throttle setting with the forward speed of the car as it lands; if you touch down with minimal forward speed while the rear tires are spinning at maximum rpm, you're likely to strip transmission gears. Likewise, landing off a fast jump with the brake on doesn't help the drive train. If your vehicle has a slipper clutch, use it! It will prevent the sudden shock of these bad landings from breaking your transmission gears.





## MRC Ironman

The Ironman from our electric "Monster Truck Shootout" (March 1999) was sitting on a shelf just waiting for a project, so we decided give it the jump-truck treatment. There aren't a lot of aftermarket options available for it, so we got creative and bolted on some parts from other vehicles. If you have an Ironman and want to see nothing but air under it, this setup is for you.

### PARTS

#### MRC

Bearing set  
Shock towers (F/R)  
Rear body mount

#### OFNA

1/8 F/R shock set

#### Pro-Line

Ford F-150 body  
Agitator rims (F/R)  
Masher 2000 tires

#### Traxxas

Hex hub

#### Robinson\*

25-tooth pinion

#### RPM

Rear hubs for Traxxas

#### MIP

HPI CVD axles for RS4 MT

### MODIFICATIONS

• **Chassis.** We buzzed off the mechanical speed-control mounts but left the stock chassis otherwise unchanged. It's tough.

• **Suspension.** The Ironman now sports double shock towers front and rear. While beefing up the suspension, we decided to go all out and bolt on a full set of OFNA\* 1/8-scale buggy shocks. These burly dampers should be able to take a beating. We had to add several down-travel limiters to the inside of the shocks to prevent the axles from drooping so far that they would interfere with the outdrive cups. The shocks' bottom ball cups are MRC\* units screwed directly onto the OFNA shock shafts with a little force.

• **Drive train.** The tranny is also relatively unchanged, but we added a full set of ball bearings and a slipper clutch. In place of the stock dogbones, we used MIP CVDs meant for the HPI RS4 MT. To use them, we had to swap the stock rear hub for an RPM rear hub (originally meant to fit the Traxxas Stampede). Replacing the rear hub carriers is very important if you plan to jump the truck as we did, as the stock units break easily under such abuse.

• **Electronics.** A standard Hitec\* servo takes care of the steering responsibilities; hey, if it breaks, it's only 20 bucks for a new one. An Airtronics M8 radio system controls the truck, an LRP\* F1 ESC regulates power from the 7-cell DuraTrax battery pack, and a Reedy\* 12-turn Pulse R motor powers the vehicle.

• **Body, wheels and tires.** We replaced the stock dish rims with Pro-Line Agitator rims for the Traxxas Nitro Stampede (we used "front" rims all around). To adapt the rear rims to the Ironman, we used Traxxas hex wheel adapters and shortened the MRC axle pin so the adapter could slide into place. Topping the truck off is a Pro-Line Ford F-150 painted by Bob "Clutch Nut" Hastings.

Doubled-up body mounts support the rear of the body.

**1. The modified rear hubs fit the arms perfectly, but we did enlarge the hinge-pin hole to accept a Traxxas screw pin. CVDs can be used with the new setup; the hex hubs are from HG. 2. This is the double rear shock tower. While we were at it, we doubled up on the rear body mounts, too. Long body clips from Take Off slide through both sets of holes. 3. The front tower has been doubled up, too. With a couple of spacers, the OFNA 1/8 shocks fit nicely.**

\*Addresses are listed alphabetically in "Featured Manufacturers" on page 216. ■



**Pete jumping himself. Don't try this at home.**









# MOD-MOTOR



## Facts, features, tuning tips—and DYNO NUMBERS

**W**e've dispensed this advice many times to many readers and fellow hobbyists over the years: if you want to get more performance out of your "entry-level" car or truck, install a machine-wound modified motor. That good advice has only gotten better, thanks to a spate of new motor releases that brings even greater horsepower (and lower prices) to the machine-wound scene. Which motor is fastest? Strongest? Cheapest? All the answers are here, along with tuning tips, your most asked questions and—best of all—real dyno numbers to help you choose the best mod motor for your machine. With more than 50 motors listed (and even more out there for which we didn't have room), there's sure to be one for you.

### ORION

#### ORBITAL 2 MACH MOD

Orion's Orbital motors share the same can but have different features. The Mach Mods are the econo powerplants; they use bushings in the can and endbell. Installed bullet connectors make installation a snap, and surface-mounted capacitors keep glitch gremlins at bay. Timing is not adjustable, but Orion uses two different cans with different timing to suit the winds; 14-turn and higher motors have 20 degrees of timing; 13-turn and lower have 14 degrees.



#### AT A GLANCE

- ⚡ Surface-mounted capacitors.
- ⚡ Installed bullet connectors.
- ⚡ Bushed, non-adjustable endbell.

## Machine-Wound, Hand-Wound ... What's the Difference?

To understand the difference between hand-wound and machine-wound motors, you first need to understand what "winding" refers to. If you disassemble a motor, you'll notice that the armature (the part that spins) has wire wound around it. Those "windings" of wire determine the motor's power output. All motors have a certain number of "winds" and "turns," but we generically refer to these as the "wind" of a motor (for the record, the wind is the number of strands of wire wrapped around the armature, and the turns are the number of times the wire is wrapped; for example, a "12



# SHOOTOUT

by Peter Vieira



## ORBITAL 2 PRO-BB

The racier "Pro-BB" Orbital features ball bearings (hence the name) and an adjustable endbell. Polarized brush heat sinks are a nice touch, especially in those cars that make it hard to see the endbell; just solder the positive wire to the side of the motor with the red brush heat sink and the negative wire to the black heat-sink side, and you'll be set. Of course, if you use the included, installed bullet connectors, you won't even have to worry about that!

### AT A GLANCE

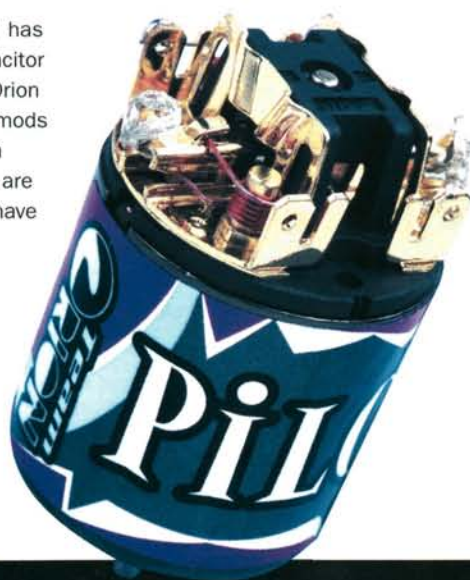
- ✦ Installed bullet connectors.
- ✦ Ball bearings.
- ✦ Surface-mounted capacitors.
- ✦ Polarized brush heat sinks.
- ✦ Adjustable timing.

## PILOT

This is Orion's least expensive mod, but it still has some nice features, such as an installed capacitor and plug-in bullet connectors. Oddly enough, Orion epoxy-balances the Pilots, but not the Orbital mods (see "What to Look for in a Mod Motor" for an explanation of each balancing method). Pilots are brushed, but the 11-, 13- and 15-turn models have a ball bearing in the endbell.

### AT A GLANCE

- ✦ Plug-in bullet connectors included.
- ✦ Ball-bearing endbell in 11-, 13- and 15-turn models.
- ✦ Epoxy-balanced.
- ✦ Fixed endbell.



## "The most powerful motor will make my car fastest—right?"

**Wrong.** Although it's tempting to rush out to the hobby shop to buy the motor with the biggest power number on the chart, you won't be able to use that power if your vehicle isn't set up for it. The hottest motors will make life difficult for "sport" ESCs and will drain a 1500mAh pack in 3 minutes or less; that isn't much fun time. If you're way off the mark on your gearing, you may even smoke your new motor or ESC on the first run; no one wants that! Here's a rough guide to matching your motor to your machine:

• **14 turns and less.** For trouble-free running and decent run times, these winds require racing-quality ESCs and high-capacity packs (2000mAh or more). If you have a big-tire monster truck, gear it as low as possible, but you'd really be better off with a milder motor. Pan cars, racing sedans and competition off-road cars are the best homes for the low-wind powerhouses.

• **15 to 18 turns.** These "less powerful" winds can actually make your car or truck faster than very low-wind motors because they produce more torque. Look at the chart: that torque equals low-rpm power to spin big off-road tires and turn the relatively tall stock gearing of most vehicles. You'll go faster and still have decent run times, and sport-level electronics should be able to cope with these winds without difficulty.

• **19 to 27 turns.** These mildest of mods are still fire-breathing monsters compared with the plain silver motors included with many kits, but they won't overtax mechanical speed controls or bottom-rung ESCs. You'll also enjoy long run times—close to those your kit motor delivered.

double" has 2 strands of wire wrapped around the armature 12 times).

As the name suggests, machine-wound motors are wound by a machine, and hand-wound mods are wound by a flesh-and-blood dude with really strong fingers. He takes the time to carefully wrap the wire as tightly as possible, using as little wire for the job as he possibly can. The winder is also careful to wind the poles of the armature as equally as possible to minimize the balancing the armature requires when complete, and he does any required balancing with epoxy (the preferred method). Hand-

wound motors are also dyno'd and factory-tuned for maximum performance and do offer an edge over machine-wound mills; overall, a hand-wound motor will deliver greater power and efficiency than a machine-wound motor with the same wind. Is the edge worth double the money? For many racers—no. Unless you're always in the top half of the A-main and your skills are so good that the need for a slight horsepower/efficiency boost is all that's keeping you out of first place, a hand-wound mod is not absolutely necessary.



## About Timing

The "timing" of a motor relates to the position of the brushes relative to the magnets. When the brush is perfectly centered over the magnets, the motor is said to have 0 degree of timing. If the endbell (and with it, the brushes) is rotated opposite to the

direction of motor rotation, the timing becomes "advanced," and if it is rotated in the same direction as armature rotation, the timing becomes "retarded." Timing is measured as the number of degrees the brushes are rotated from the centered position; some motors have calibration marks on the decal to show where the timing is set. Although "timing" refers to the position of the brushes over the magnets, all motors use a molded-in pointer or the endbell screw to measure timing in relation to a "zero point" on the can located between each pair of mounting holes.

So how does timing affect performance? As timing is advanced, amp draw and motor speed increase, but efficiency suffers. Retarded timing makes the motor run slower and hotter, and it's never used; 0 degree is as close as you should ever get. As a rule, winds with 15 or fewer turns are best set with 0 to 15 degrees of advanced timing; milder winds may go as high as 20 degrees. When in doubt, go with less timing; your car will run cooler, longer.

### MEASURING TIMING

If your motor doesn't have calibration marks, you can get this device from Fantom; just drop the motor in and read the setting. You can also measure timing with a calculator and some masking tape. Here's how:

1. Wrap the tape around the motor, and cut it so the ends meet squarely. Remove the tape and measure its length precisely in millimeters. This measurement is the circumference of the motor (you can also calculate circumference by measuring the diameter of the can with a calipers, then multiplying it by 3.14).
2. Divide 360 by the circumference in millimeters.
3. The result equals the number of degrees measured by 1mm.
4. To calibrate your motor, mark a piece of tape in 1mm increments, then stick it to the can, making sure to line up the center of the tape with the 0-degree mark between the magnets. Now you can easily see where your timing is set; just remember how many degrees each mark equals (tip: write it on the can!). If you try another setting and don't like the results, you'll be able to reset the timing precisely.



## What to Look for in a Mod Motor

All the motors in this guide will outperform the basic motor included with most kits, but some have more features than others. Here are the most popular features and the benefits they provide:

**Adjustable/removable endbell.** Two benefits here: first, an adjustable endbell allows you to increase or decrease the motor's tim-

## MOD MOTOR TUNING TIPS

Machine-wound mods really are bolt-on horsepower—install one, and you will go faster. But who doesn't want to go even faster than that for just a little effort and fewer than five more bucks? Here's how to make your mod fly its fastest.



**1** True the commutator. Even new comms aren't true; find a friend with a lathe, or have your local shop true the comm for you.



**2** Align the brush hoods. You'll need a tool for this; Parma/PSE makes a nice one.

**3** Install premium-quality brushes. We like Trinity's "E" brush, but any good, aftermarket brush will be better than the stock lumps included with machine-wound mods.

**4** Break in the brushes. Just let the motor spin with power from a 4-cell pack and provide cooling air with a fan. If you run the battery until the pack dumps, that will be plenty.



**5** Adjust the timing. If your motor came set with 0 timing, dial it up to about 15 degrees (advanced) as a starting point. You can even do this with the motor running; you'll hear its speed increase.

How much "go" will you get? Check out the before and after dyno numbers for this Trinity 17T Speed Gems Sapphire; we dyno'd it at each step of the way.

	Max. power (watts)/rpm	Max. rpm	Torque (Nmm)
Stock	125.8 @ 13,782	25,769	161.3
Trued comm, installed serrated brushes	148.6 @ 13,281	23,731	195.1
Timing advanced to 30°	162.3 @ 13,065	28,661	207.6

ing (see "About Timing" for details). In addition, the endbell can be removed, and this allows access to all the components for maintenance and repair, which greatly extend the motor's service life.

**Ball bearings.** These friction-fighters will help your motor run cooler and faster and won't get "sloppy"

the way a bushing will. If you plan to buy a really hot wind (fewer than 15 turns), it's a very good idea to get a bearing motor.

**Surface-mounted capacitors.** This new innovation, pioneered by Team Orion, eliminates the need to solder capacitors to the motor. This leaves the mounting tabs free to accept slide-on



## PEAK PERFORMANCE

### THUNDERBOLT

Peak's budget motor is feature-packed; surface-mounted capacitors and installed bullet connectors are the highlights. The Thunderbolt is basically a clone of the Orion Mach Mod and also uses two can types; a 14-degree model for the hotter winds and a 20-degree model for the milder ones.

#### AT A GLANCE

- ✦ Installed bullet connectors.
- ✦ Surface-mounted capacitors.
- ✦ Fixed endbell.



### STRATOS

The Stratos is Peak's better machine mod; it adds ball bearings and polarized brush heat sinks to the Thunderbolt's features.

#### AT A GLANCE

- ✦ Adjustable timing.
- ✦ Installed bullet connectors.
- ✦ Surface-mounted capacitors.
- ✦ Ball bearings.
- ✦ Polarized brush heat sinks.



## REEDY

### PULSE R

Reedy's fully bushed Pulse R mods use the latest Yokomo can and have fully adjustable timing. Brush heat sinks are the only frill; bullet connectors and capacitors are not included.

#### AT A GLANCE

- ✦ Bushed armature.
- ✦ Includes brush heat sinks.
- ✦ Adjustable timing.
- ✦ Capacitors, bullet connectors not included.



### SPEED GEMS 2

The Speed Gems series is an RC classic. Each "gem" represents a different wind, ranging from mild (Quartz, 19 double) to wild (Opal, 10 triple). The Garnet 13 double is the latest "jewel," and it's the only Speed Gem that uses the D3.5 armature from Trinity's hand-wound line. The Gems' hearty, simple designs have a record of reliability.

#### AT A GLANCE

- ✦ Includes two soldered-on capacitors.
- ✦ Ball-bearing equipped.
- ✦ Adjustable timing.



### MONSTERS OF TOURING

Don't think these motors are just for touring; as the packaging boldly claims, they're also "excellent for off-road use!" The Monsters are easy to install, too, thanks to installed bullet connectors. If you have a "sport" ESC or a mechanical speed control, you should be able to hook up your new motor with just a screwdriver—plug and play.

#### AT A GLANCE

- ✦ Includes installed bullet connectors.
- ✦ Single installed capacitor.
- ✦ Bushed, non-adjustable endbell.



### CHAMELEON

Think of the Chameleon as a "spec mod"; with its spec-style, tagged, 19-turn armature, the Chameleon is tough to tamper with yet fully rebuildable. Ball bearings help it last a long time, and the armature is also sold separately, so you should have no problem keeping its performance fresh. The Chameleon features Trinity's "flat" can and fixed, indexed endbell to prevent timing changes and ensure fair competition; that makes this the one exception to the "Adjustable timing is better than fixed" argument.

#### AT A GLANCE

- ✦ Ball-bearing-supported armature.
- ✦ Single installed capacitor.
- ✦ Non-adjustable endbell ...
- ✦ ... keeps racing fair.



bullet connectors (if you wish to use them), and the tiny caps are kept out of harm's way (soldered-on caps are prone to being damaged when used in off-road buggies and trucks).

**Bullet connectors.** These are the RC standard for hooking up motors to speed controls; they're usually found on entry-level vehicles and

"sport" ESCs. A motor equipped with bullets can be plugged directly into most kits that include speed controls. They're convenient, but as you seek greater performance, you'll want to consider soldering the speed-control leads directly to the motor.

**Epoxy balancing.** After it has been wound, a motor's armature must

be balanced. This is usually done by drilling away material from the "heavy" side of the armature (which also weakens the magnetic field and slightly reduces power). Epoxy-balanced motors use bits of epoxy paste stuck to the "light" side of the armature to achieve balance without affecting the magnetic field.

**Brush heat sinks.** These tiny aluminum turnings lend a tiny bit of extra heat-dissipation capability to a motor's endbell hardware, but mostly, they just look cool. Some of Orion's motors use colored heat sinks to indicate polarity.



## How We Tested the Motors

All motors were tested using a Robitronics Pro Master dyno hooked up to a laptop computer. The Pro Master is an inertial dyno, so there's no unreliable slave motor factored into the equation. All motors were tested with the stock brushes as assembled by the manufacturer using the stock timing settings. Before testing, all the motors were broken in so the brush faces made full contact with the commutator, and each was spooled up three times on the dyno to ensure accurate, reliable readings.

Motor	Caps	BB	AT	BT	BC	Bal	Time	Power (watts)/rpm	Max. rpm	Max power (watts)/rpm	Torque (Nmm)	Current	Time to max. power (sec.)	List price
<b>PEAK PERFORMANCE STRATOS</b>														
11 triple	SMC2	■	■	ST	■	D	6	222.6 @ 19,883	43,333	78.3 @ 29,868	192.5	147.1	0.67	\$49.99
12 triple	SMC2	■	■	ST	■	D	6	225.1 @ 20,550	43,171	77.8 @ 32,787	188.6	147.4	0.72	\$49.99
13 triple	SMC2	■	■	ST	■	D	6	214.5 @ 18,990	38,150	81.0 @ 28,286	195.0	138.6	0.64	\$49.99
14 double	SMC2	■	■	ST	■	D	6	203.9 @ 16,645	34,944	80.1 @ 25,365	202.3	137.2	0.53	\$49.99
17 triple	SMC2	■	■	ST	■	D	6	164.7 @ 13,655	26,400	78.2 @ 21,750	207.3	110.7	0.42	\$49.99
19 triple	SMC2	■	■	ST	■	D	8	157.5 @ 12,657	24,128	79.0 @ 19,258	211.2	112.9	0.39	\$49.99
<b>PEAK PERFORMANCE THUNDERBOLT</b>														
10 triple	SMC2	—	—	ST	■	D	14	200.2 @ 21,791	45,135	68.9 @ 28,787	163.6	131.7	0.90	\$31.99
11 triple	SMC2	—	—	ST	■	D	14	210.3 @ 21,755	45,020	75.2 @ 30,894	176.6	142.2	0.84	\$31.99
12 triple	SMC2	—	—	ST	■	D	14	193.7 @ 20,288	41,741	75.6 @ 29,384	183.3	133.7	0.77	\$31.99
13 triple	SMC2	—	—	ST	■	D	14	202.9 @ 17,646	37,391	73.3 @ 24,604	195.1	135.8	0.58	\$31.99
14 triple	SMC2	—	—	ST	■	D	20	206.7 @ 16,671	38,203	77.4 @ 24,959	213.1	132.9	0.51	\$31.99
17 triple	SMC2	—	—	ST	■	D	20	185.1 @ 14,509	30,911	78.5 @ 22,597	220.2	119.3	0.44	\$31.99
19 triple	SMC2	—	—	ST	■	D	20	172.4 @ 13,447	29,775	78.5 @ 21,841	222.7	110.5	0.39	\$31.99
21 single	SMC2	—	—	ST	■	D	20	158.5 @ 12,381	26,532	80.7 @ 20,155	225.3	104.9	0.35	\$31.99
21 triple	SMC2	—	—	ST	■	D	20	160.7 @ 12,446	26,292	79.0 @ 18,395	231.1	104.0	0.36	\$31.99
23 single	SMC2	—	—	ST	■	D	20	149.2 @ 11,268	24,476	78.8 @ 19,403	228.6	95.4	0.33	\$31.99
23 triple	SMC2	—	—	ST	■	D	20	136.6 @ 10,436	21,818	78.3 @ 17,627	225.8	92.2	0.31	\$31.99
<b>TRINITY SPEED GEMS 2</b>														
Opal 10 triple	■ 2	■	■	ST	—	D	0	177.7 @ 21,853	45,797	70.1 @ 32,336	148.7	127.8	1.02	\$49.99
Topaz 11 triple	■ 2	■	■	ST	—	D	0	163.5 @ 22,564	42,943	65.8 @ 32,871	134.5	122.9	1.18	\$49.99
Diamond 12 double	■ 2	■	■	ST	—	D	0	169.6 @ 17,468	37,504	73.1 @ 28,601	171.1	119.8	0.67	\$49.99
Garnet 13 double	■ 2	■	■	ST	—	D	0	182.5 @ 16,732	31,701	78.8 @ 25,595	212.8	130.8	0.57	\$49.99
Platinum 13 triple	■ 2	■	■	ST	—	D	0	175.1 @ 18,798	35,373	73.1 @ 27,159	173.6	132.1	0.75	\$49.99
Onyx 14 double	■ 2	■	■	ST	—	D	0	159.8 @ 15,570	32,165	72.0 @ 25,063	176.1	115.9	0.58	\$49.99
Jade 15 quad	■ 2	■	■	ST	—	D	0	171.5 @ 15,704	31,774	76.0 @ 23,933	188.5	118.8	0.54	\$49.99
Ruby 16 triple	■ 2	■	■	ST	—	D	0	147.4 @ 16,667	28,722	75.0 @ 16,667	172.4	105.6	0.67	\$49.99
Sapphire 17 single	■ 2	■	■	ST	—	D	0	125.8 @ 13,782	25,769	68.3 @ 21,033	161.6	107.3	0.56	\$49.99
<b>TRINITY MONSTERS OF TOURING</b>														
13 double	▲ 1	—	—	ST	▲	D	14	200.0 @ 21,975	47,421	71.3 @ 31,343	149.2	134.2	0.94	\$27.99
15 double	▲ 1	—	—	ST	▲	D	14	182.5 @ 14,988	31,897	77.6 @ 24,027	198.2	124.6	0.47	\$27.99
17 double	▲ 1	—	—	ST	▲	D	14	173.3 @ 14,561	30,264	78.9 @ 23,066	201.1	115.8	0.47	\$27.99
19 double	▲ 1	—	—	ST	▲	D	14	158.7 @ 12,988	25,333	76.9 @ 19,951	207.7	118.4	0.39	\$27.99
<b>TRINITY CHAMELEON</b>														
19 single	■ 2	■	—	ST	—	D	24	162.2 @ 14,233	35,924	74.5 @ 23,552	200.2	114.4	0.46	\$49.99
<b>TEAM ORION ORBITAL 2 MACH MOD</b>														
10 triple	SMC2	—	—	ST	▲	D	14	201.9 @ 21,669	44,205	71.6% / 21,355	174.9	142.3	0.89	\$32
11 triple	SMC2	—	—	ST	▲	D	14	196.2 @ 19,769	41,268	70.9% / 28,301	186.1	136.5	0.73	\$32
12 triple	SMC2	—	—	ST	▲	D	14	205.3 @ 18,219	39,767	75.3% / 26,829	190.5	145.6	0.62	\$32
13 triple	SMC2	—	—	ST	▲	D	14	179.0 @ 15,402	35,533	72.4% / 26,505	203.3	129.4	0.50	\$32
14 double	SMC2	—	—	ST	▲	D	20	159.8 @ 15,750	32,165	72.0% / 25,063	176.1	115.9	0.58	\$32
17 triple	SMC2	—	—	ST	▲	D	20	179.1 @ 13,810	31,146	75.9% / 22,857	223.7	118.1	0.39	\$32
19 triple	SMC2	—	—	ST	▲	D	20	162.4 @ 12,656	26,839	77.4% / 20,951	222.7	110.6	0.38	\$32
21 single	SMC2	—	—	ST	▲	D	20	154.9 @ 11,288	25,542	75.1% / 20,400	232.7	104.3	0.31	\$32
23 single	SMC2	—	—	ST	▲	D	20	139.8 @ 10,272	22,140	71.9% / 15,627	228.5	92.1	0.28	\$32
<b>TEAM ORION ORBITAL 2 PRO-BB</b>														
10 triple	SMC2	■	■	ST	▲	D	5	219.9 @ 22,874	45,099	74.9% / 31,898	162.9	144.5	0.92	\$49.99
11 triple	SMC2	■	■	ST	▲	D	5	220.3 @ 20,957	41,974	77.6% / 29,841	181.3	145.1	0.77	\$49.99
12 triple	SMC2	■	■	ST	▲	D	5	196.9 @ 18,870	37,242	78.6% / 29,769	181.2	137.4	0.70	\$49.99
13 triple	SMC2	■	■	ST	▲	D	5	202.7 @ 19,874	35,602	78.6% / 26,582	196.6	140.7	0.73	\$49.99
17 triple	SMC2	■	■	ST	▲	D	5	173.8 @ 14,131	29,194	80.8% / 22,749	210.8	119.1	0.43	\$49.99
19 triple	SMC2	■	■	ST	▲	D	5	166.5 @ 13,009	26,265	80.3% / 21,167	216.3	112.7	0.38	\$49.99
<b>TEAM ORION PILOT</b>														
11 double	■ 1	E	—	ST	■	E	0	145.2 @ 19,718	40,366	56.4% / 30,722	136.1	126.7	1.01	\$20
13 double	■ 1	E	—	ST	■	E	0	140.5 @ 16,720	37,253	59.2% / 25,543	138.7	119.2	0.78	\$20
15 double	■ 1	E	—	ST	■	E	0	133.9 @ 16,504	30,172	61.3% / 25,676	149.9	110.7	0.74	\$20
17 double	■ 1	—	—	ST	■	E	0	123.4 @ 12,809	25,736	63.9% / 22,699	176.5	102.1	0.50	\$20
19 double	■ 1	—	—	ST	■	E	0	121.2 @ 11,158	23,101	68.9% / 19,427	186.6	95.0	0.40	\$20
21 double	■ 1	—	—	ST	■	E	0	115.4 @ 10,339	21,898	63.0% / 17,369	184.3	99.5	0.35	\$20
23 single	■ 1	—	—	ST	■	E	0	104.8 @ 10,286	20,337	68.2% / 16,013	180.7	83.9	0.36	\$20
27 single	■ 1	—	—	ST	■	E	0	86.5 @ 9,473	19,110	63.7% / 14,689	164.5	81.0	0.37	\$20
<b>REEDY PULSE R</b>														
9 double	—	—	■	ST	—	D	12	225.8 @ 24,333	53,430	71.9% / 32,530	165.8	147.2	1.02	\$38
10 double	—	—	■	ST	—	D	12	234.3 @ 23,602	51,640	76.1% / 30,606	180.7	151.7	0.89	\$38
11 double	—	—	■	ST	—	D	12	230.6 @ 22,684	46,970	78.3% / 30,054	183.4	150.1	0.83	\$38
12 double	—	—	■	ST	—	D	12	220.1 @ 18,904	42,873	76.6% / 30,271	194.4	144.8	0.62	\$38
13 double	—	—	■	ST	—	D	12	213.3 @ 18,219	38,639	77.1% / 27,071	187.0	145.3	0.62	\$38
14 double	—	—	■	ST	—	D	12	202.9 @ 16,808	36,687	77.2% / 26,233	195.8	138.4	0.54	\$38



# RACER news

by George M. Gonzalez

## So Cal Raceway Goes Rally



So Cal Raceway in Huntington Beach, CA, has started a successful bimonthly rally-racing class held every other Friday night. The Rally-Cross class has been added to the existing off-road venue, and the rally cars are raced on the same track as the 2WD buggies and racing trucks. The Rally-Cross is a big hit with spectators and racers because the vehicles have the scale appearance of touring cars and the off-road prowess of 4WD buggies. This combination is hard to pass up, and the vehicles look awesome in action.

I decided to compete at one of the events with my HPI RS4 Rally. On that particular evening, many factory drivers were also present to compete in this exciting new racing class. Team HPI drivers Frank McKinney and Thad Garner were there,



Here's Tony Phalen's custom TC3 creation. I like the prototype decal. All Tony did to his car was remove all of the travel limiters from the shocks, install Associated soft Green springs, HPI rally tires and a Subaru body. This thing was on rails!



As you can see, there were enough rally racers to fill two complete heats. Look closely; you'll see a few RC celebrities.

along with Trinity/Team Losi driver Josh Cyrul. Team Yokomo drivers Barry Baker, Shinnosuke Adachi and Robert Ito joined the action, and Team Losi's Richard Trujillo, Todd Hodge and Ron Rossetti were all there with production Rally Weapons. Team Associated driver Tony Phalen competed with his super-fast TC3 Rally custom creation, too.

I was amazed at how well the rally cars ran on the tough So Cal Raceway track. The track designers had set up the track so there were alternate paths for the rally cars to use instead of going through the larger



Here's a look at Team Losi's production Rally weapon. I think Losi is going to sell a ton of these cars.

jump sections, but most drivers skied their rally cars over every obstacle on the track, and for the most part, the cars maintained their composure. The rally cars were so dialed in, in fact, that many of the drivers were putting in lap times that were faster than those of the stock 2WD buggies and stock racing trucks!

I found the HPI RS4 Rally to be extremely easy to set up and very sure-footed on the track; I actually won the B-main with a car that was powered by an old 2000mAh stick pack and a worn-out stock motor. HPI soft-compound rally tires worked really well, as did the stock Yokomo rally tires that are included with the MR-4TC Rally kits. The



Above left: here's a guy you wouldn't normally find at an off-road track; Team Losi/Team Trinity factory driver Josh Cyrul also dropped by to race rally cars. He was as fast as you'd expect, but he needs a little more practice on the dirt. Right: Team Losi's Richard Trujillo had a blast bombing around his Rally Weapon on the hard-packed So Cal track surface. Several other Team Losi racers were in attendance.

Losi racers did not have production rally tires at the time, so they made their own tires by cutting up existing off-road meats. Team Losi will have new rally tires to go with the soon-to-be-released Rally Weapon.

If you live in Southern California, I encourage you to drop by So Cal Raceway on Rally-Cross night. I'm sure you'll want to run right out and buy a rally car so you can get in on this fun new class. If you already own a rally car, but your track doesn't offer a rally-racing class, show up during practice and run your car. These things are contagious, so chances are, more people will buy rally cars and soon, you'll have enough racers to fill a heat or two! That's how touring-car racing became so popular.



To make things interesting, Team Yokomo's Robert Ito (above) brought along some heavy hitters like Barry Baker and Shinnosuke Adachi. Adachi's MR-4TC Rally was dialed.



# SPEED SHOP

## Factory Team GT

The Team Associated RC10GT has been a dominant force in nitro truck racing since its introduction in 1993; it has won three consecutive NORRCA World Cup titles, and it took the checkered flag at the last three Silver State Nitro Challenge events. You'll be pleased to know, therefore, that Team Associated has just released two new GT kits that are sure to make the truck even more venerable.

The "Team kit" features a new, one-piece, blue-anodized chassis that's longer and more rigid. The new cast-aluminum tranny mount/brace virtually eliminates all chassis flexing. Also included are sealed bearings, tuned pipe and header, hard-anodized, Teflon-coated shocks, Pro-Line tires and new F-150 body. The "Factory Team kit" includes all of these great features, plus: blue titanium turnbuckles, graphite shock towers, blue-anodized tuned pipe and header, aluminum brake adapter, inline front axles, servo-saver hub, blue screws, wheel nuts and more. The Factory Team kit includes more than \$89 worth of upgrades!

Associated will also soon release its new RC10GT Upgrade kit that will allow you to convert your older-style "tub" chassis GT to new specs. The kit will include the new, lighter, stronger chassis, engine mount/brace, new "slim-line" front bumper, composite chassis tube mounts, 1.5-degree rear hub carriers, 3-degree toe-in, 2-degree anti-squat rear arm mounts and more.

**Associated RC10 GT Team kit—part no. 7067 (pull-start), 7068 (non-pull-start); \$419.**

**Associated RC10 GT Factory Team kit—7061 (pull-start), 7060 (non-pull-start); \$482.**

**Associated RC10GT Upgrade kit—7056 (pull-start), 7057 (non-pull-start); \$59.95.**



## OFNA Low-Cost Wheels, Tires and more

Check out OFNA's new Y-spoke, 5mm offset wheels. These new wheels are available in three colors (black, white and yellow) and are packaged in economical 8-packs. The best part is their low \$7.95 retail price. At less than a buck apiece, these wheels are among the best values in RC today. Not only are the hoops inexpensive, but they're also very stylish and extremely durable.

Looking for some new skins to go with your new hoops? OFNA's new 24/26mm K-1 belted slicks are just the ticket. Molded of a super-sticky compound, these tires hook up incredibly well on both asphalt and cement tracks. An inner reinforcing belt prevents the tires from ballooning during hard acceleration and also keeps the tire's sidewall intact during cornering. OFNA also offers its 24/26mm C25 belted slick that is molded from a slightly harder compound. Both of these compounds are ideal for nitro touring cars and modified-electric touring cars.

While we're on the subject of OFNA, I just



had to show you its new, one-piece tuned pipe. This "fat," two-chamber pipe is a high-quality unit that's a clone of the new NovaRossi-style touring car tuned pipe; it's available with either a square, side exhaust or a round, rear-exhaust manifold. The pipe and manifold are joined by a rubber-gasket coupler and secured by three small springs instead of the conventional silicone coupler. According to OFNA, the one-piece pipe and manifold will never come apart during a race, and it's less prone to fuel leakage. The pipe also features a rigid, 90-degree fuel pick-up and a shiny, polished-aluminum finish that looks great mounted on a nitro touring car.

**OFNA Y-spoke 5mm offset wheels—87612 (yellow), 87610 (white), 87608 (black); \$7.95.**

**OFNA 24/26mm K-1 belted slicks—87690; \$12.95.**

**OFNA 24/26mm C25 belted slicks—87694; \$12.95.**

**OFNA 1/10 sedan one-piece tuned pipe and manifold set (SE)—10075; \$49.95.**



# SPEED SHOP

## DURATRAX MAINTENANCE ITEMS

### High-Quality Screwdrivers

A set of high-quality screwdrivers can make the difference between a relaxing building session or a frustrating bout with stripped screws. DuraTrax's new line of top-shelf tools will help ensure that your next build falls into the "relaxing" category. The blades are made of chrome vanadium steel, with "grippy" heat-treated tips for maximum strength, and the rubber-coated handles have a good feel without being too squishy. DuraTrax sells bladed and Phillips screwdrivers separately and in a set of five in a storage pouch. DuraTrax also has a specialty driver for engine tuning. It's designed for carb tweaking, and with its 120mm length and 3.2mm tip, it's a handy tool for any nitro-engine enthusiast.

**Bladed screwdrivers (no. 5x100/no. 6x100)—part nos. DTXQ0100/DTXQ0102, \$3.99.**

**Phillips screwdrivers (no. 0x75)—DTXQ0120, \$2.99; no. 1x75/no. 2x100—DTXQ0122/DTXQ0124, \$3.99.**

**Engine-tuning screwdriver—DTXQ0185, \$5.99.**

**Standard screwdriver set w/pouch (bladed nos. 5x100 and 6x100; Phillips nos. 0, 1 and 2)—DTXQ0140, \$18.99.**



### Sonic Tronics Electronic Fail Safe

When PCM transmitters first appeared, a big feature of the new technology was fail-safe capability; this prevented runaways by allowing a car's onboard radio system to automatically return to a preselected setting in case of signal loss. That's still a great feature, but PCM radios are a pricey means of getting fail-safe capability. Sonic Tronics now offers a plug-in fail-safe module that will do the same job for around \$30. The Fail Safe plugs into the receiver, and the servo plugs into the Fail Safe (most users will use the unit on the throttle channel to preset "off" or "idle," but you can set the Fail Safe any way you like, with any servo). Various models are offered to accept Futaba, JR, KO, Airtronics and Hitec servo plugs.

**Sonic Tronics Fail Safe—360 (Futaba), \$32.95.**



### DuraTrax Pit Tech Deluxe Car Stand

Looking for a sturdy stand to support your ride while you wrench on it between heats? DuraTrax's new, deluxe model features a rotating upper plate that's designed to accommodate electric vehicles with a lower battery channel, molded rubber inserts that grip the chassis securely and an extra-large parts bin molded into the base to store all those little parts that tend to disappear. To save space in your pit bag, the upper plate also unscrews.

**DuraTrax Pit Tech Deluxe Car Stand—DTXC2370, \$13.99.**

### Metric Hardware

DuraTrax now offers metric hardware in various sizes to suit any metric kit. Phillips-, socket- and flat-head fasteners are sold in sets with sturdy plastic cases to organize and separate all the parts by size. If you need only a few screws, DuraTrax also offers small quantities of self-tapping and machine-thread screws of all types: setscrews, nuts, washers and E-clips.

**DuraTrax metric Phillips-head-screw set (200 pieces)—DTXQ0100, \$15.99; metric socket-head-screw set (124 pieces)—DTXQ0125, \$19.99; metric flat-head-screw set (188 pieces)—DTXQ0150, \$19.99. Small-quantity hardware packages—various part nos., \$3.79.**





# 5 QUESTIONS

Age: 24

Last big win: '98 Truck Nats

Home track: Pro-Line test track

First RC car: Tamiya Rough Rider

Sponsors: Pro-Line, Associated, Reedy, LRP, MIP, KO Propo, Kimbrough and Thunder Paints



**Scott Hughes**  
TEAM ASSOCIATED/PRO-LINE  
FACTORY DRIVER

**Radio Control Car Action:** Congratulations on your win at the Silver State Championships. Who do you think were your toughest competitors there?

Scott Hughes: It took me a little while to get around Austin Dvorak and Billy Easton. I battled with them for a couple of laps until I was able to make a pass.

**RCCA:** I noticed you were using Mugen's new MT12 rear exhaust engine. What do you think?

SH: Well, thanks to Steve O'Donnell, I was able to run that motor. The first time I ran it was in the B-main. I noticed that it had better fuel mileage and a lot more bottom end. It was also very reliable and easy to tune. Thanks, Steve!

**RCCA:** I heard they had to scrub one of the qualifiers. How did that affect your standings?

SH: I don't think it affected me that much. I was the sixth qualifier in the B-main, and I don't think I would have been able to improve my best time. Who knows? Maybe it would have helped me, but in the end, it didn't matter.

**RCCA:** At what point during the 45-minute A-main did you realize that you had a shot at the championship?

SH: I actually thought I had a good chance when I was leading in the B-main. I ended up lapping most of the field after the first 20 minutes. I passed Mark Pavidis for the lead in the A-main, and at that moment, I knew it was my race.

**RCCA:** How did you celebrate your big win? Did you have time to cruise the strip after the race?

SH: I celebrated my win by cleaning my truck for the trophy presentation. It had been a while since I was at the top of the podium, so I wanted my truck to look real pretty. Unfortunately, there was no time to cruise the strip; Mark and I had a four-hour drive ahead of us, and it was already 6:30 p.m.

## UNDER THE HOOD

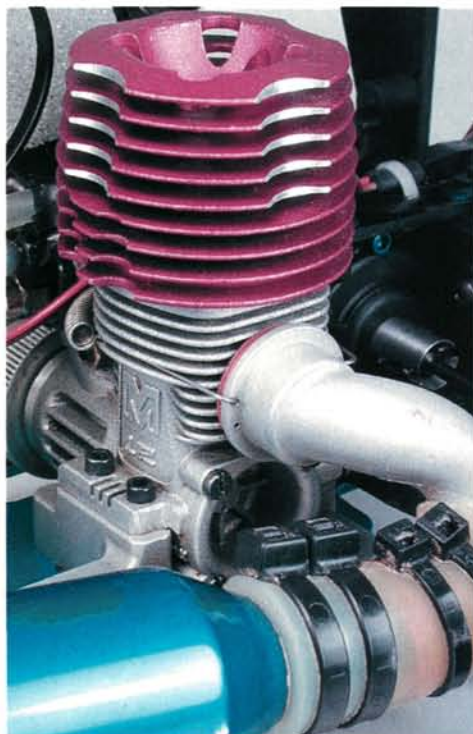
SCOTT'S A-MAIN-WINNING  
ASSOCIATED RC10GT



**Mugen RC10?** Nah, Scott just used a Mugen receiver box to keep his gear out of harm's way. I'm sure gas racers will be quick to steal that idea ... I know I will.



Nothing you can't buy here. By the time you read this, the Factory Team kit should be available equipped as shown.



**A Mugen MT12 round-port, rear-exhaust engine powers Scott's winning ride.**



In addition to the usual RC10Gt hop-up parts, you can see the new front-end braces for the new plate chassis.

### MODIFICATIONS

Scott's truck is a basic RC10GT with the addition of a few smartly placed Factory Team hop-ups. The only modification was the installation of a receiver holder borrowed from a Mugen 1/8-scale buggy. Mugen's new MT12 round, rear-exhaust engine gave Scott the perfect blend of power and reliability he needed to take the checkered flag in Vegas.

### EQUIPMENT

**BODY:** Pro-Line Ford F150  
**STEERING SERVO:** Airtronics 94157  
**RADIO:** KO Propo  
**EXHAUST MANIFOLD:** Mugen Pipe; Associated  
**RECEIVER:** KO Propo  
**THROTTLE/BRAKE SERVO:** Airtronics 94737  
**TIRES (front/rear):** Pro-Line Bow Tie/Pro-Line Edge (M3)  
**ONBOARD BATTERY:** 6V NiMH  
**GEARING:** stock  
**ENGINE:** Mugen MT12  
**FUEL:** O'Donnell

### SILVER STATE CHAMPIONSHIP SETUP

	FRONT	REAR
Caster/anti-squat	30-degree block	3°
Camber	2°	3°
Toe-in/out	0	4.5
Shock		
—oil	35WT	30WT
—piston	No. 2	No. 1
—limiters (inside/outside)	0	0
—spring	Silver	Green
—upper mount (shock tower)	A	A
—lower mount (suspension arm)	C	E
Camber-rod mount	Stock	G
Ride height	Level	Slightly below level



# UNDER THE HOOD

BILLY'S A-MAIN-WINNING  
TTR EB-4



NovaRossi power—always lethal. Spring manifolds have all but replaced silicone couplers in the racing ranks.



As usual, Billy's race machine is neatly set up.



Right: Nuova Faor makes the hinge-pin brackets, and there's another Jammin' tower in the rear.

Notice the aluminum bracket for the inboard upper hinge pins and Jammin' shock towers.



## MODIFICATIONS

- Nuova Faor parts throughout.
- Split diff.
- Thorsens front and center.
- Jammin' shock towers.
- MIP CVDs throughout.

## EQUIPMENT

**BODY:** Jammin'  
**THROTTLE/BRAKE SERVO:** Airtronics 94258  
**RADIO:** Airtronics  
**EXHAUST MANIFOLD:** NovaRossi .086  
**RECEIVER:** Airtronics  
**ONBOARD BATTERY:** Team Orion 6V NiMH  
**TIRES:** Champion  
**STEERING SERVO:** Futaba S9402  
**GEARING:** Stock/13/stock gear  
**ENGINE:** O'Donnell

## SILVER STATE CHAMPIONSHIP SETUP

	FRONT	REAR
Toe-in/out	1 (out)	3 (in)
Shock oil	35WT	35WT
Shock piston	MIP	MIP
Shock limiters (inside/outside)	None	None/10mm rear
Shock spring	MIP	TTR black
Shock upper mount (shock tower)	Middle	Middle
Shock lower mount (suspension arm)	Middle	Third out

# 5 QUESTIONS

**Age:** 22  
**Last big win:** 2WD Modified Winter Champs  
**Home track:** So Cal Raceway  
**First RC car:** Kyosho Ultima Rampage  
**Sponsors:** Associated/Reedy, Pro-Line, Airtronics, MIP, LRP, Thunder Paints, TTR, O'Donnell, Mechanic's Wear



**Billy Easton**  
TEAM ASSOCIATED/TTR DRIVER

**Radio Control Car Action:** Way to go, Billy, on your win at the Silver State Nitro Challenge! The 1/8-scale Buggy class is always extremely demanding and competitive, and many times, the racing becomes a battle of attrition. To what do you owe your success at this year's event?

**Billy Easton:** Well, this year, my luck was awesome. My car and motor both performed perfectly; they allowed me to just drive the car around the track the best I could.

**RCCA:** What were the biggest obstacles you had to overcome during the qualifiers and Mains?

**BE:** The largest obstacle seemed to be fuel mileage on the engine. At first, it seemed as though I had to take a pit stop during the qualifiers. But later I could get about 7 or 7 1/2 minutes on a tank.

**RCCA:** At what point during the A-main event did you know you had the win in the bag?

**BE:** In gas racing, the race is never really in the bag, but the race was in the bag as soon as I heard the tone go off to end the race.

**RCCA:** Do you feel that you have a good chance to win the Worlds? Will you step up your training before this event, or are you going to treat it like any other race?

**BE:** Everyone has a chance. Many things determine the winner, so it's hard to say whether I'll win. As far as training goes, sure; I will be doing some practicing, and I will approach it with the utmost confidence.

**RCCA:** Who are your toughest competitors going to be at the Worlds?

**BE:** Well, I have never really competed in an 1/8-scale gas Worlds, so I would have to say that anyone who has qualified will be tough competition.



14<sup>th</sup>

Annual

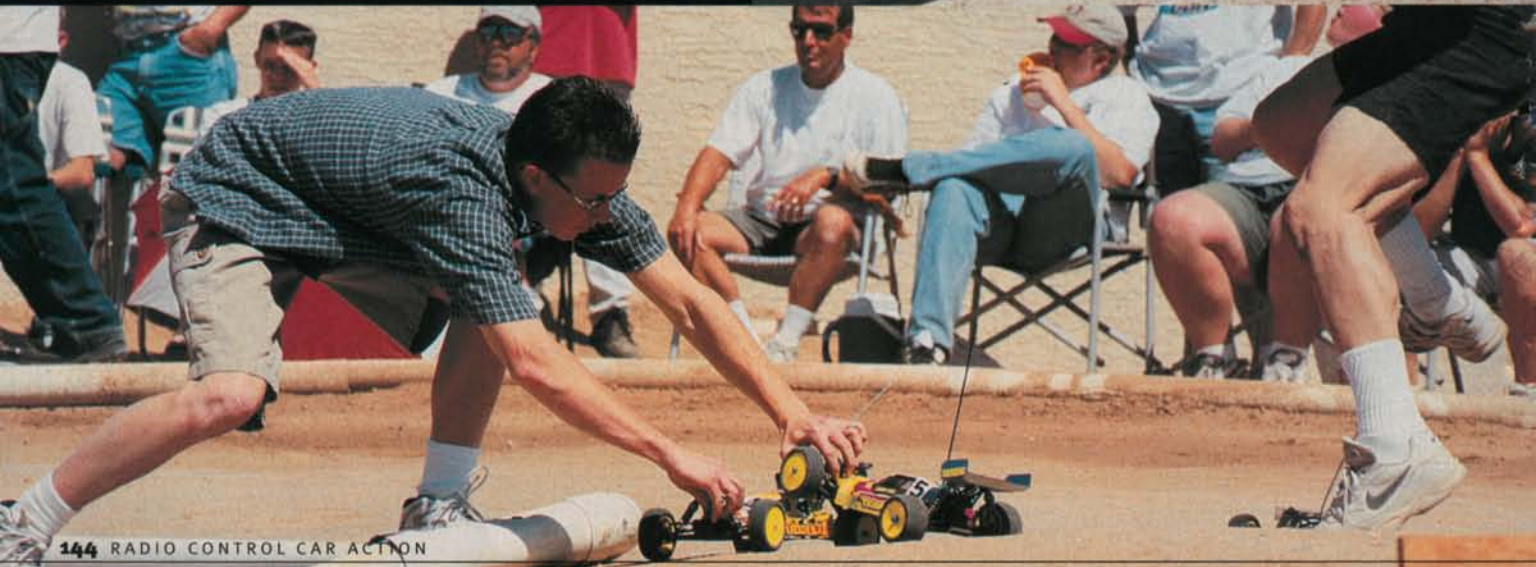
## CACTUS

## Duel in the desert

by George M. Gonzalez

Every year, the town of Scottsdale, AZ, livens up considerably as thousands of Arizona State students spend their spring break roaming the streets and boulevards looking for fun under the desert sun. Though this may be prime party season for the college crowd, hundreds of dedicated racers head to Arizona at the same time for an entirely different type of fun in the sun: the Pro-Line and RC Car Action Cactus Classic held on the first weekend of spring every year at Scottsdale RC Raceway.

Motor homes and campers surrounded the huge, outdoor raceway facility, and tents and pit tables were filled with racers, all of whom were enjoying the sunshine and comfortable temperatures that remained in the high 70s throughout the weekend. Although the Cactus Classic is one of the few events that's geared toward sportsmen and novice racers, many of the world's best drivers showed up to gain valuable wheel time and to compete against the talented locals who frequent the Scottsdale RC Raceway track.







# CLASSIC





## QUALIFYING AND A-MAIN OVERVIEW

• **2WD Stock.** Utah resident Beazer Martin picked up the TQ after posting a 13/4:18.82—a full second faster than Rodney Clemente, who qualified in second. Nick Sava was a lap behind the leaders, but he was still awarded a prime spot on the grid for the single A-main event. After a scuffle at the start, Martin managed to squeeze by to lead the rest of the racers around the first lap. Martin ran into trouble during the second lap and dropped back to sixth; Adam Olson sneaked by to claim the lead, and Clemente eased back into second. Around the halfway point, Sava made his move, claimed the lead and remained there throughout the rest of the race. Olson stayed in second, and Trevor Clement came out of nowhere to claim third.

• **Expert 2WD Stock.** Team Orion/Team Losi driver Jimmy Babcock claimed the TQ after posting a blazing-fast 13/4:05.40 best time that was more than 3 seconds faster than Ryan Maifield's best time. Jerry Walter's 13/4:08.70 best time earned him the third spot on the A-main grid.

Babcock got the holeshot, but Maifield tucked right behind Babcock's Triple-X to claim second, and Jerry Walter played "follow the leaders." Walter got around Maifield to claim second on the very next lap, but he was able to hold on to the position for only a few laps because Maifield regained second on lap 5. Babcock held on to the lead throughout most of the race, but on lap 12, a mistake cost him the lead and Maifield saw nothing but open real estate in front of his vehicle. Thirteen-year-old Maifield ended up taking the checkered flag to win the Expert 2WD Stock championship, while Babcock had to settle for second. Trevor Adamo, who toggled between third and fourth place throughout the race, finished third.



Here's a shot of Chadd Brockman's concurs-winning truck with its Batman paint theme.

• **Stock Truck.** Matt Davis earned the TQ honors, but it didn't come easy because Trevor Clement posted a time that was less than  $\frac{1}{100}$  second shy of Davis's best time. Rodney Clemente qualified in third, but the entire field posted fast 12-lap runs.

Matt Davis got the holeshot during the Main, and he didn't look back until he crossed the finish line 4 minutes later to claim the victory. The battle for second between Clement, Clemente and Ryan Phillips, however, kept the spectators cheering. In the end, Clemente secured second, and Phillips ended up third.

• **Expert Stock Truck.** Jerry Walter was the man to beat during qualifying, but his 13/4:08.93 best time was untouchable. Albert Guardado qualified in second, and Joe Pillars ended up in the third-place spot on the A-main grid. As a footnote, the entire field posted blazing-fast 13-lap runs and only 7 seconds separated the first through 10th positions.

Walter used his prime spot on the grid to his advantage; he shot out in front and didn't slow down until he had lapped the entire field, including Pillars, who was in second pursuing the leader. Walter ended up posting a 14/4:17.22 in the Main, which was simply amazing.

Pillars easily claimed the second-place spot, and Kraig Krueger ended up in third.

• **2WD Modified.** When the four rounds of qualifying had concluded, it was Team Trinity/Team Losi driver Matt Francis who ended up with the TQ. Team Trinity/Team Losi driver Brian Kinwald ended up qualifying in second, and Team Trinity/Team Losi driver Mark Francis wrapped up the 1-2-3 sweep for their sponsors. The

Modified class drivers faced triple A-mains to determine the champions, though.

Matt Francis, Kinwald and Mark Francis (in that order) led the rest of the field around the track for the first three laps during the first A-main, but Kinwald soon found the lead, and Mark got around his brother to claim second. Then disaster struck: Kinwald's car broke, and Mark Francis resumed first place. Mark held on to the lead for the rest of the race, but his brother Matt pursued him tenaciously. Mark Francis won the race, and Matt Francis claimed second. Jimmy Jacobson ended up in third.

The second A-main was all Matt Francis, as he got the holeshot and never budged from first. Kinwald was behind Francis the entire time and ended in second place; Jimmy Jacobson again claimed third.

The third A-main was again Matt Francis's race. After getting the holeshot, he distanced himself from the rest of the field and ended up with a large 2-second margin over second-place Kinwald. Mark Francis won the battle for third. After the scores had been tallied, it was Matt Francis who claimed the 2WD Modified championship; his brother Mark secured second place, and Brian Kinwald wrapped up third.



Matt Francis's 2WD Modified class-winning Triple-X.



Brian Kinwald drove this Triple-XT to a Mod-class win.



Brian Kinwald took 4-Mod as well—this is his Double-X4.



• **Modified Truck.** Team Orion driver Jimmy Jacobson took the TQ honors after posting a 14/4:16.57 best time. Matt Francis was close behind him with a 14/4:16.98 best time. Brian Kinwald qualified third after posting a 14/4:17.40.

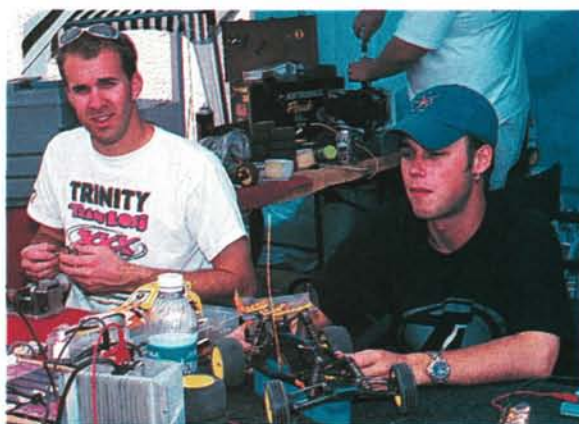
Jacobson held the first-place position throughout most of the first A-main, but he did fall into second place during laps 2 and 5. Team Orion/Team Losi driver Travis Amezcua came back from fourth place to end up in second, and Team Losi/Team GM driver Brian Dunbar secured third.

Jimmy Jacobson got a bad start in the second A-main, and Brian Kinwald quickly took advantage of the situation. Kinwald remained in first place throughout the race, while Matt Francis rolled in to claim second. Jacobson had to settle for third.

Jimmy got the holeshot in the final A-main, and he held on to the lead until the very last lap of the race. Matt Francis stayed in second place throughout the race and constantly pressured Jacobson. Then, from out of nowhere, Kinwald made his way around Francis and set his sights on the leader. Jacobson's B3 and Kinwald's Triple-X hit the back straightaway at precisely the same moment, with Kinwald winning the drag race to the end of the straight to claim the lead and, soon afterward, the victory.

Jacobson took second and Matt Francis claimed third. After winning the second and third A-mains, Kinwald was awarded the championship. Jacobson put on a great show and ended up in second, while Matt Francis took the third-place trophy.

• **4WD Modified.** Matt Francis was the man to beat in this class, too, after he posted a 14/4:06.53 to secure the TQ. Jimmy Jacobson's 14/4:07.76 was good



Matt Francis and Brian Dunbar "chill" during one of the breaks.

enough to qualify in second, and Brian Kinwald's 14/4:08.52 gave him the third-place spot on the grid for all three Mains.

Francis shot out in front in the first A-main, with Jacobson close behind in second. By the fifth lap, Kinwald got around Jacobson and held on to second for most of the race until he went into "attack mode." On the very last lap, Francis hit a pipe and his car got out of shape just long enough for Kinwald to take the lead and the win. Francis settled for second, and Mark Francis, who had been in fourth for most of the race, took third.

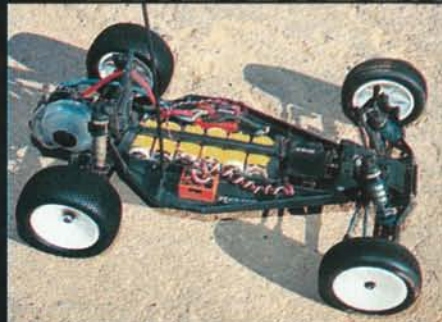
The second A-main spelled disaster for Francis, as his car broke a suspension arm on the second lap. This left Kinwald in the lead; he soon got around the entire field and ended up easily winning the race. Jacobson had to settle for second and Travis Amezcua rolled in 6 seconds later to claim third.

Kinwald had already secured the championship by winning the first two Mains, so he sat out the third and allowed the other racers to compete for second and third places without being distracted by "the Great Kinwald." Matt Francis got the holeshot and stayed



Jimmy Babcock works uninterrupted on his buggy.

## EXPERT 2WD STOCK



This B3 was piloted to 2WD Expert Stock victory by Ryan Maifield.

## EXPERT STOCK TRUCK



Jerry Walter's Expert Stock Truck class-winning Losi Triple-XT.

## 2WD STOCK



Nick Sava took 2-Stock with his Triple-X.

## STOCK TRUCK



Matt Davis's Stock Truck class-winning Losi Triple-XT.



# WINNERS

## 2WD STOCK

FIN.	QUAL.	DRIVER	CHASSIS	MOTOR	BATTERY	ESC	RADIO	TIRES	PINION/SPUR
1	3	Nick Sava	Losi Triple-X	Bonzai	Sava Cells	Tekin	Airtronics	Losi	21/84
2	5	Adam Olson	Losi Triple-X	Trinity	Trinity	LRP	Airtronics	Losi	27/92
3	4	Trevor Clement	Losi Triple-X	Bonzai	Reedy	LRP	Hitec	Losi	26/92
4	6	Mark Garvey	Losi Triple-X	Trinity	—	Novak	Airtronics	Losi	23/78
5	2	Rodney Clemente	Losi Triple-X	Morales	Team Orion	LRP	Airtronics	Losi	26/78

## TRUCK STOCK

1	1	Matt Davis	—	—	—	—	—	—	—
2	3	Rodney Clemente	Losi Triple-XT	Morales	GM	LRP	Airtronics	Losi	24/88
3	5	Ryan Phillips	Losi Triple-XT	Trinity	—	LRP	Airtronics	Losi	21/86
4	2	Trevor Clement	Losi Triple-XT	Bonzai	Reedy	Novak	Hitec	Losi	21/88
5	4	Beazer Martin	Losi Triple-XT	Birdman	Pro-Match	Novak	Airtronics	Losi	20/88

## EXPERT 2WD STOCK

1	2	Ryan Maifield	Associated B3	Reedy	Reedy	Novak	Airtronics	Pro-Line	22/78
2	1	Jimmy Babcock	Losi Triple-X	Team Orion	Team Orion	LRP	Airtronics	Losi	22/82
3	4	Trevor Adamo	Losi Triple-X	Trinity	Trinity	Novak	Airtronics	Losi	28/92
4	3	Jerry Walter	Losi Triple-X	Race Prep	Team Orion	LRP	Airtronics	Losi	20/78
5	9	Jeremy Kopp	—	Pro Match	Pro-Match	Hitec	Hitec	Losi	—

## EXPERT STOCK TRUCK

1	1	Jerry Walter	Losi Triple-XT	Race Prep	Team Orion	LRP	Airtronics	Losi	22/88
2	3	Joe Pillars	Losi Triple-XT	Fantom	Fantom	LRP	Airtronics	Losi	20/88
3	4	Kraig Krueger	Associated T3	Reedy	Reedy	Tekin	Airtronics	Pro-Line	20/87
4	7	Mike Kendall	Losi Triple-XT	Peak	Peak	Tekin	Airtronics	Losi	22/88
5	9	Robert Kuhl	Losi Triple-XT	Bonzai	World Class	Novak	Airtronics	Losi	22/90

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**2WD MODIFIED**

FIN.	QUAL.	DRIVER	CHASSIS	MOTOR	BATTERY	ESC	RADIO	TIRES	PINION/SPUR
1	1	Matt Francis	Losi Triple-X	Trinity	Trinity	LRP	Airtronics	Losi	24/92
2	3	Mark Francis	Losi Triple-X	Team Orion	Team Orion	—	—	—	—
3	2	Brian Kinwald	Losi Triple-X	Trinity	Trinity	Novak	Airtronics	Losi	23/92
4	5	Jimmy Jacobson	Associated B3	Team Orion	Team Orion	Novak	Airtronics	Pro-Line	21/81
5	7	Billy Caley	Losi Triple-X	Trinity	Trinity	LRP	Airtronics	Losi	23/78

**TRUCK MODIFIED**

1	3	Brian Kinwald	Losi Triple-XT	Trinity	Trinity	Novak	Airtronics	Losi	18/90
2	1	Jimmy Jacobson	Associated T3	Team Orion	Team Orion	Novak	Airtronics	Pro-Line/Losi	19/97
3	2	Matt Francis	Losi Triple-XT	Trinity	Trinity	LRP	Airtronics	Losi	21/100
4	10	Travis Amezcua	Losi Triple-XT	Team Orion	Team Orion	Novak	JR	Losi	17/88
5	8	Scott Hughes	Associated T3	Reedy	Reedy	LRP	KO	Pro-Line	—

**4WD MODIFIED**

1	3	Brian Kinwald	Losi Double-X4	Trinity	Trinity	Novak	Airtronics	Losi	21/100
2	1	Matt Francis	Losi Double-X4	Trinity	Trinity	LRP	Airtronics	Losi	21/100
3	2	Jimmy Jacobson	Losi Double-X4	Team Orion	Team Orion	Novak	Airtronics	Losi	19/86
4	4	Mark Francis	Losi Double-X4	Team Orion	Team Orion	—	—	—	—
5	7	Travis Amezcua	Losi Double-X4	Team Orion	Team Orion	Novak	JR	Losi	18/86

in first place throughout the race to claim the A-3 victory. Jacobson finished second, and Jason Corl took third after holding that spot from the get-go.

As mentioned, Kinwald had already earned the 4WD Mod championship; Matt Francis secured second, and Jimmy Jacobson took third.

**FINAL THOUGHTS**

The weather was awesome, the racing was exciting, and the event overlapped with spring break in Scottsdale, AZ. Talk about perfect planning! Attendance reached an all-time high at the 14th Annual Cactus Classic, and that proves that off-road racing is still going strong. As always,

we congratulate all the winners and send special thanks to Pro-Line, our cosponsor, and to the staff of Scottsdale R/C Raceway for doing such a fantastic job as hosts. ■

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BY KEVIN  
HETMANSKI

# Project Double Dagger

**A**fter reviewing the Tamiya\* Wild Dagger for the August '99 issue of *RC Car Action*, I spent many nights looking at it, trying to see what kind of project truck I could build around it. There are lots of ways to go, but with those two motors poking out of the gearboxes, I kept coming back to a high-speed concept. The finished product definitely lives up to its name "Wild"; with 14 cells, dual 9-turn mods and a "two of everything" theme, the

once humble back-yard basher is now a 6-pound remote-control land missile!

## THE CONCEPT

Aware of the headaches Greg Vogel had when he built his finicky—but insanely fast—dual-motor TA03 with 12 cells running through a single ESC, I knew I wanted to use independent power systems. The Double Dagger is controlled by a single radio and receiver, but otherwise, it's like two trucks in one. Each motor is powered by its own battery and throttled by its own ESC. Although the truck runs 14 cells, each ESC pumps only the voltage of 7 cells to power a single motor. Having 7 cells and a 9-turn motor is still a workout for any ESC, but remember, each power system has to carry only "half" the truck. I was confident this setup would work, and believe me, it does!

## THE STUFF

- **Trinity 2000 7-cell stick packs.** I chose Ni-Cds over nickel-metals for this project because I value punch and power over run time (not that 2000mAh isn't plenty of capacity). One battery is mounted on the chassis in the original location and is held in place by Tamiya's optional quick-change battery holder (part no. 53346). To allow for the seventh cell, I spaced the end plates of the battery holder farther from the chas-

sis using threaded rod and aluminum standoffs. I strapped the second battery to the chassis' top with two large, reusable zip-ties—not pretty, but effective.

- **Reedy 9x3 Fury modifieds.** I replaced the kit's 540 stock motors with a pair of Reedy\* 9-turn-triple Fury modifieds with the new "Millennium Wind" configuration that wraps the armature with wires of two

gauges; one "thick," two "thin." According to Reedy, this gives the motor high torque and lots of power. Of course, a 9-turn anything has to be fast! To cope with the mad yank of the twin mods and 7-cell packs, I added steel, 20-tooth pinion gears from Robinson Racing Products\* for durability and top-end speed.

- **Novak Atom ESCs.** Since each ESC has to power only "half" the truck,

## DRIVIN' IT

With two freshly charged battery packs in place, I mashed the throttle and Double Dagger lit up all four tires as it induced a bad case of suspension hop. That's especially impressive when you consider that the truck was wearing sticky street treads with the weight of 14 cells and two motors pressing it to the black-top. With just a little more finesse on the throttle trigger to get the tires hooked up, I tried again and the

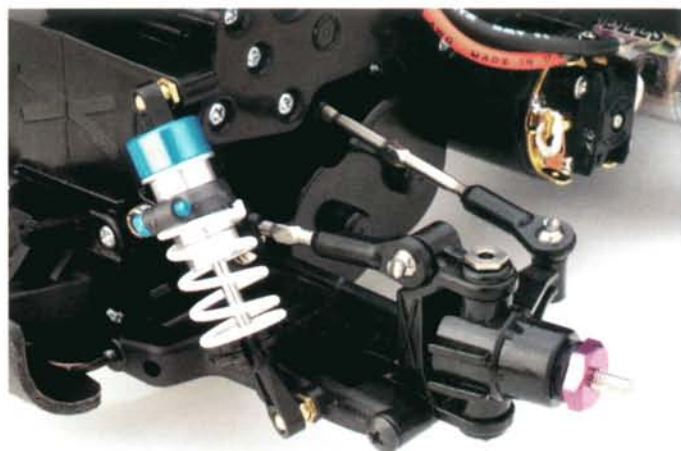
acceleration was ballistic! Satisfied that everything was working properly, I set up for a few runs past the radar gun. The highest speed reached was "only" 36mph. I had geared the truck as the preset gear mesh allowed, but I wanted more speed. To "gear up," I installed a set of Pro-Line Masher 2000 tires, whose taller profile essentially gives the truck a higher gear ratio and makes it faster. The truck was a bit of a handful because of the larger tires, but this time, it reached 45! I like that number a lot better, but if I can figure a way to bolt in larger pinions, I'm goin' for 50. I'll keep you informed.







**Pro-Line Road Rage truck tires have a wide contact patch that provides this crazy truck with lots-o-traction. The tires are wrapped around these beautifully machined wheels from JPS.**



**Associated white springs provide the Dagger with ultra-stiff suspension. I replaced the fixed upper links and steering rods with adjustable titanium. I can now quickly fine-tune the suspension with a turn of a wrench.**

and chassis space is very limited, I chose Novak\* Atom ESCs for the Double Dagger. The Atoms' tiny footprint isn't wide enough to span the chassis, so I mounted each on a brass strip that bridges the chassis. I set up the speed controls independently then connected them to the receiver with a Y-harness.

• **Airtronics 94738 steering servo.** Heavy truck, 4WD, lots of traction, big power .... Yep; this is a job for superservo. I mounted a powerful Airtronics\* 94738 unit with Tamiya's aluminum servo mounts (49092) that reduce servo-flexing and add a subtle custom touch. A heavy-duty Kimbrough\* servo-saver replaces the stock unit, and adjustable tie rods with Rocket City\* ball ends replace the original servo links. These links are heavy-duty, easy to adjust, and get input from the servo to the wheels without slop.

• **Tamiya Low Friction shocks.** The short-travel friction shocks included with the Wild Dagger barely cut it for mild play, so I knew they wouldn't be up to the workout Double Dagger would give the suspension. I replaced them with Tamiya's beautifully made Low Friction pieces (53141). To keep the suspension in check, I set up the shocks with one-hole pistons, Associated springs (3954), and 80WT silicone shock oil. The upper links work fine but are not adjustable, so I added adjustable titanium rods and Rocket City ball ends (87). To complete the setup, I installed Tamiya's lightweight aluminum kingpins (53141).

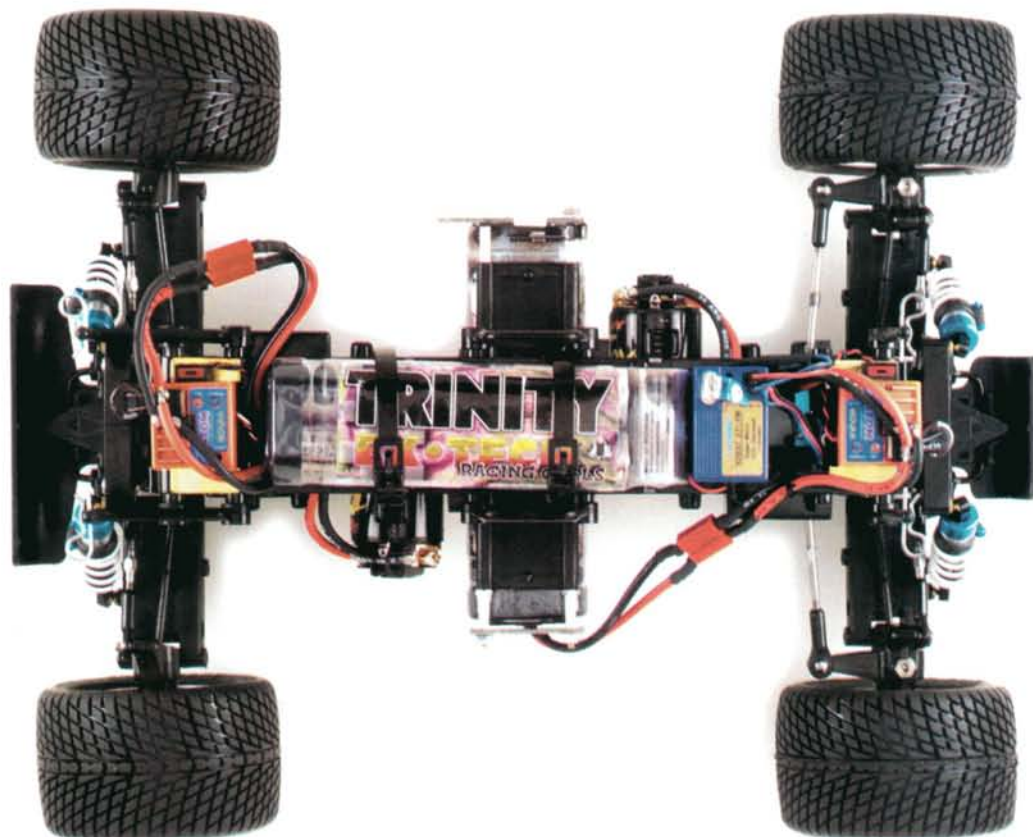
• **JPS machined wheels.** JPS\* wheels add a little more glamour to my decked-out ride, but they are not direct bolt-ons; the wheels have a little too much material in the center and prevent the wheel nut from being threaded on all the

way. I used my lathe to turn down the problem area until the nut fit properly. JPS told me that it will address this problem; it should just be a matter of clicking some new numbers into their CAD system. To add a little more aluminum to the Double D, I installed aluminum wheel hexes from Tobee Craft\* (40980). These trick pieces use an O-ring to capture the crosspins, and they fit perfectly.

• **Pro-Line Road Rage T tires.** Trucking isn't just about knobs and chevrons; sometimes street is where it's at, and this is one of those times. The soft-compound Pro-Line\* Road Rage T tires (1062)



**The lower battery is held in place with Tamiya's quick-release battery holder. I spaced it the proper distance away from the chassis with a small piece of aluminum tube. The other side was equally spaced the same way.**





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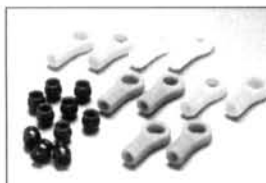


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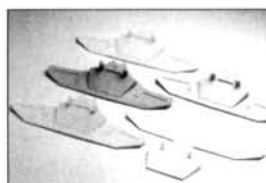


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4x4

look killer on the JPS rims and match the street mission perfectly. I installed the foam inserts with Trinity\* Bomb glue to prevent them from bunching.

• **Dynamite Red Seal bearings.** With a pair of doubles winding up the drive train, the Double Dagger would wear out the kit's plastic bushings in a hurry, so I replaced them with bushings with Dynamite\* Red Seal 5x11 bearings. These bearings have (surprise!) red seals to keep harmful dirt, dust and debris away from the tiny balls inside.

• **Pro-Line Ford F-150 body.** The original body was tossed aside in favor of Pro-Line's awesome F150 truck body (3083). Its sleek lines help the truck slice through the air and go well with the truck's wide stance. I painted it with Parma's\* water-based FasKolor paints. The Superman symbol on the front hood makes the truck faster—really!

*\*Addresses are listed alphabetically in "Featured Manufacturers" on page 216. ■*

## SHOP TALK

I read your May 2000 "4x4" body-painting article and thought that the truck you showed was the coolest thing I ever saw. I wonder which parts you used (axles, chassis, 4-link suspension, etc.) because I looked at my hobby shop and didn't find them. Were they custom-made, or is there an after-market manufacturer? Please help; I've always wanted one of those trucks that look real. [email]

**Derek LaRoque**

In your "4x4" column in the May 2000 issue, you give painting tips for hard ABS bodies. The truck used to show off your painting skills is incredible! I should probably recognize it, but I don't even know where to begin guessing. Could you tell me what it is, who makes it and anything else about it? Those wheels are trick also. Who made them? The truck appears to have a lot going on inside it. What does it do? Any or all of that information would be nice. [email]

**Chris Hammond**

Guys, I'm glad you like the truck. Unfortunately, you cannot buy it anywhere, since I built it from scratch. It has Sees aluminum wheels, Tamiya Bruiser axles, Associated shocks and Pro-Line tires; the rest was pretty much scratch-built. For more information—and a great picture of me lookin' all serious—check out the April 1998 issue of *RC Car Action*. Don't have that issue in your collection? Call (800) 877-5169 to order one.

If you have any problems or questions about trucks, or if there is something you would like to see in "4x4," email me at [kevinh@airage.com](mailto:kevinh@airage.com) or send your letters to:

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RC Car Action

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Ridgefield, CT 06877-4606 USA



### Parma Chevy Silverado body

Check out this new Parma truck body patterned after the 1999 Z71 Chevy Silverado (part no. 10161). It features a molded-in tonneau cover and decals for the light and grill details. It's sure to be a popular choice for Bow-Tie enthusiasts!



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# The Technology of Tuned Pipes

by Chris Chianelli

I've been touting the virtues of tuned pipes for many years. They help increase power, improve fuel efficiency and reduce engine temperatures. It's a no-brainer! The nitro public at large understands much of this, but as nitro enthusiasts have become more aware of the benefits of the tuned pipe, the focus has shifted: the question now is which tuned pipe is the best.



I'm no expert on tuned pipes—or expansion chambers, as they're often called; I simply have years of experience with different exhaust configurations. This gives me the street smarts to suggest which pipe would be best for a given application, but I needed to brush up on the science to tell you why one pipe performs differently from another. I spent months consulting some of the best minds in the RC industry and others who have made careers in science of exposing the “hows” and “whys” of “the pipe.” I won't bore you to tears with technical mumbo jumbo, but I hope that the combination of my experience sprinkled with a little technical information will help point you toward the right pipe for your application.

## WHAT IS A TUNED PIPE?

A tuned pipe is actually part of a tuned exhaust system that begins with a header that's attached to the engine. The header is usually a constant-diameter pipe that can bend in many directions to direct the exhaust flow to the tuned pipe. It's the outlet for the exhaust gases, and we hope it deadens engine noise slightly. The header and the tuned pipe are usually connected with a short section of flexible tubing and a couple of zip-ties.

## THE BASICS

For the benefit of those who want to know *why* a tuned pipe helps every aspect of 2-stroke-engine performance, I'll cover some of the basics.

A 2-stroke engine's intake transfer ports *and* the exhaust port are open at roughly the same time. This means that a portion of the fuel/air mixture that enters the engine simply passes straight

out through the exhaust. It doesn't take a rocket scientist to figure out that the escaped fuel is wasted and can't contribute to making power. Many years ago, engineers figured out that by cleverly crafting the exhaust pipe into a specific shape, the exhaust itself could be used to keep more unburned fuel in the engine to increase power. Now, when the exhaust port opens, the pressure created during the combustion process creates a pressure “wave” that travels through the header and into the tuned pipe. The tuned pipe's small exhaust outlet releases some of the exhaust pressure, but a significant amount remains in the pipe. The engineers carefully “tuned” the length and shape of the exhaust pipe (hence the name “tuned pipe”) to send some of the pressure wave back up the pipe to force the escaping fuel mixture back into the engine. In practice, tuned-pipe design is more involved than I make it sound, but this is generally why tuned pipes can be so beneficial.

## THE DETAILS

So, you've decided that you want a tuned pipe; inevitably, your next question is “Which one should I get?” Man, is that a loaded question!

Its intended use will determine how long you'll want to research your pipe purchase. If you want to improve your vehicle's performance just to have fun at a faster pace, then any header/tuned-pipe combination will do. Choose one that is properly sized for your engine, of course, but you almost can't go wrong if you switch from a muffler to a tuned pipe. You may not get all the power that could be expected if you had spec'd the ideal

**You almost can't go wrong if you switch from a muffler to a tuned pipe ... anything is better than a muffler;**



setup, but the point I'm trying to get across is that anything is better than a muffler; mufflers are for leaf blowers!

Racing enthusiasts, or those who simply want to get maximum possible performance, may want to take a longer look at what will work best for their application. Listed below are some facts about the best tuned-pipe configuration. Much of this information has been borrowed from the development of pipes for larger 2-stroke engines, but it still serves as a guide to many pipe manufacturers and engine tuners in the RC industry. Nitro-burning engines are a slightly different animal from the engines for which these guidelines were formed, so it isn't an exact crossover, but most of our tuned pipes are formulated according to this data.

- **Header.** The ideal header would start with an area that's roughly 10 to 15 percent larger than the cross-section of the exhaust port. The ideal header would also expand outward at an angle of roughly 2 to 4 degrees. This subtle expansion, when combined with those of the tuned pipe, helps scavenge, or suck, the exhaust from the engine. Many headers designed for RC car engines don't follow these guidelines, however; they are usually too large in diameter and are straight. Straight pipes are less expensive to manufacture, and the gains offered by a tapered pipe are debatable, at best, for RC applications.

- **Coupling.** The header and tuned pipe are usually joined with a flexible coupling of mostly heat-resistant flexible tubing. The coupling has little to do with the effectiveness of the pipe, unless it fails prematurely or it has not been properly installed. The best installation has only a slight gap between the header and the pipe. This ensures smoother exhaust flow and avoids exposing the coupling to excessively high temperatures. Be careful not to allow the pipe and header to touch each other, however, as the vibration will cause minor damage to both. The real puzzler is that I have also seen this metal-to-metal high-frequency vibration cause radio interference. Yup; for some reason, when the two pieces of metal rub together, it can cause the radio to glitch.

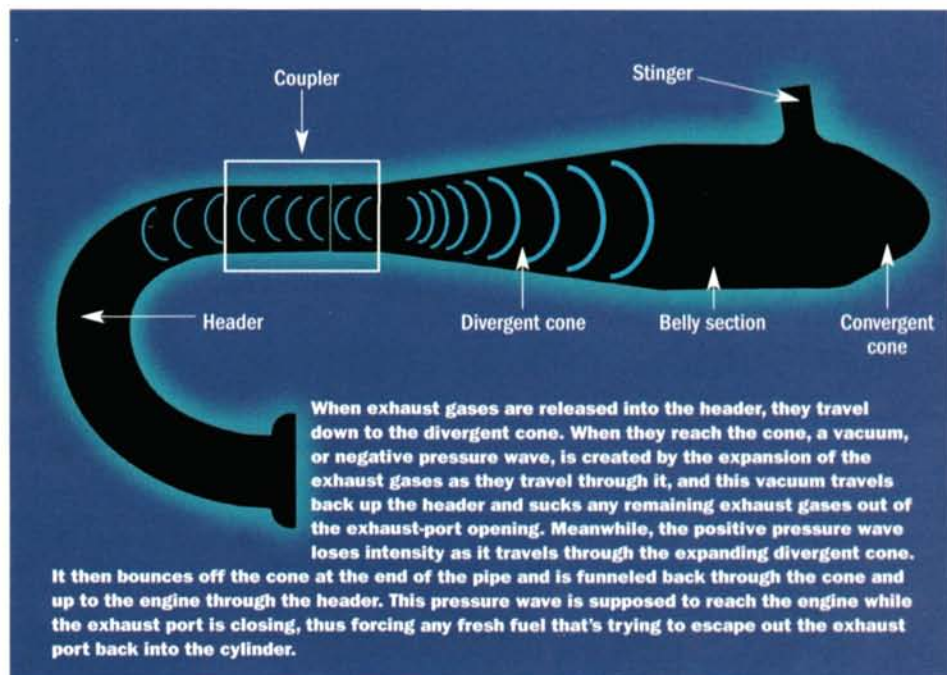
- **Divergent cone.** The first part of a tuned pipe is the divergent cone. It's the part just beyond the coupling, and it's flared outward. As the exhaust-pressure wave travels through this expanding section of the pipe, it creates a vacuum of sorts behind it. This helps pull out (scavenge) any residual exhaust gases in the cylinder, and it aids in the delivery of fresh fuel. The ideal angle of the divergent cone is in the ballpark of 10 degrees, but some pipes, such as those available from Paris Racing\* and Team Associated\*, have a much greater angle.

The angle of this section of the pipe determines the duration and intensity

of both negative and positive pressure waves. A sharper angle of the divergent cone makes the negative pressure wave more intense but shorter in duration. This makes scavenging more efficient but limits it to a more narrow rpm range. A more gradual divergent cone reduces the intensity of the negative wave, but it lasts much longer. This increases the rpm range at which the negative wave reaches the cylinder while the exhaust port is still open. It's a balancing act of sorts: more performance over a limited rpm range or less performance over a broader rpm range.

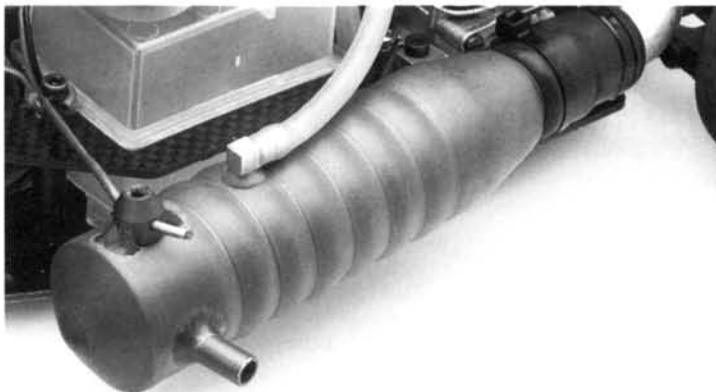
The divergent cone also has the same effect on the returning pressure wave. The positive exhaust pressure that doesn't escape from the pipe bounces back toward the header. The angle of the divergent cone has the same effect on the return trip. A more pronounced angle makes the positive pressure wave more intense but shorter in duration, while a more gradual angle makes it less intense over a longer duration. This pressure wave helps stuff fresh fuel back into the cylinder when the exhaust port closes.

- **Belly.** The belly is the straight section of a tuned pipe; the important dimension here is length. Remember I said that as the exhaust-pressure wave enters the divergent cone, a negative wave is sent back toward the engine. The positive pressure wave then continues through the belly of the pipe, bounces off the convergent cone (I'll get to that in a minute) and heads back toward the engine; the length of this belly section determines how long it takes for the pressure wave to reach the engine. A shorter belly means the pressure wave has less distance to travel to the end of the pipe and is therefore on its way back more quickly. Logic dictates that a longer belly increases the time it takes for the pressure wave to return to the engine. The relative timing between the positive wave and the negative wave is what's at stake here. A short section reduces the delay between the two waves and is best for developing maximum power at high rpm ranges; a longer section increases the delay between the two waves and is more suited to low-rpm power.

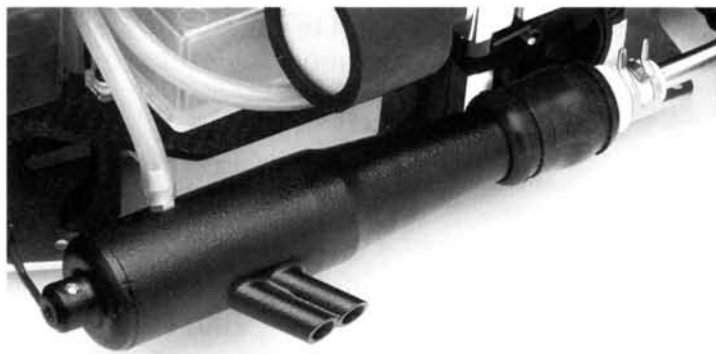


mufflers are for leaf blowers!

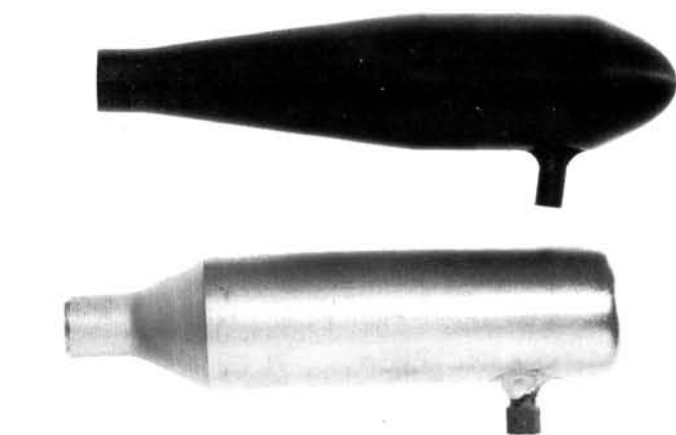




The Paris turbo ringed tuned pipe shown here is typical of pipes designed for  $\frac{1}{10}$  on- or off-road nitro racing. It's suitable for .10 to .15 small-block engines. The sharp angle of the divergent cone and the long belly section show that this pipe is best suited to low-end power production. The length and inside diameter of the exhaust outlet (stinger) is specified by race-sanctioning organizations.



The Form Racing pipe shown here was actually developed for 4-stroke-engine use. The divergent cone's shallow angle and the skinny belly section make it less suitable for use with 2-stroke engines, and its dual exhaust tips would make it illegal for sanctioned races. Four-stroke engines are far less sensitive to exhaust configuration because they have mechanical valves; 2-stroke engines rely on exhaust configuration to manage fuel and exhaust flows.



The Paris AL110S pipe shown at the top has a gradually angled divergent cone and a short belly section. This configuration broadens the power band and increases power production at high rpm. The stock Associated pipe shown below it has a more radical divergent-cone angle and a very long belly section. This type of cone intensifies the pressure waves, but it shortens their duration. This cone plus the long belly section mean that this pipe is great for intense, low-speed power production.

- **Convergent cone.** This is at the end of the belly section and reflects the pressure wave back toward the engine. The cone's taper angle influences how long the pressure wave takes to return along the tuned pipe. Again, a more pronounced taper causes a more intense pressure wave of short duration; a gentle taper results in a longer, less intense wave. A taper angle in the range of 15 to 20 degrees, or roughly double the angle of the divergent cone, is thought to be ideal.

- **Stinger.** This is the last part of the tuned pipe. The stinger's diameter and length are important to performance but are largely irrelevant in RC car applications. The diameter and length of the stinger are governed by most sanctioning bodies, therefore, most pipes are designed to meet these regulations, and there is less variety of stinger sizes. The ideal stinger diameter is about 60 percent of that of the header pipe, and its length should be 10 to 12 times its own diameter.

### PUT IT ALL TOGETHER AND ...

The exhaust port opens and a positive pressure wave of exhaust in the cylinder is released into the header and travels through the header to the divergent cone. As it travels through the divergent cone, a negative pressure wave (vacuum) is sent back up the header. The negative pressure helps to pull any remaining exhaust out of the cylinder and helps to draw in a fresh charge of fuel/air mixture. Meanwhile, the original positive pressure wave runs through the pipe's belly, bounces off the convergent cone (some of it sneaks out through the stinger) and returns along the pipe and through the header. This positive wave should reach the engine while the exhaust port is still open so it can force any fresh fuel/air that has tried to sneak out of the cylinder back into the engine before the port closes. That, in a nutshell, is how a tuned pipe is supposed to work.

### TUNING THE TUNED PIPE

You thought it was over, didn't you? Now that you know how a tuned pipe works, you're better educated for the next time you select one. "But," you may be asking, "how does that help me now?" Well, unless you have a machine shop and are prepared to modify a pipe or make an entirely new one, it won't help you until you buy a new pipe. But you can do one thing with your existing tuned pipe that can improve performance: tune it! That's right; you can *tune* a tuned pipe!

The header's length has a significant impact on performance. It's much like a trombone: you slide it out farther, and it resonates at a lower pitch. Slide it out less, and it resonates at a higher pitch—same thing with tuned pipes. Experiment by cutting  $\frac{1}{8}$  inch at a time off the header, and run the engine between cuts. The idea is to keep cutting until, as the boys from across the pond say, it's really "on song." That means the engine and exhaust system are in sync and singing in harmony. This is when the engine makes the most power. The rule of thumb is that a longer header is better for bottom-end power, while a shorter header makes your engine scream on the top end. You can go too far in either direction, so don't be reckless; you'll do more harm than good.

*\*Addresses are listed alphabetically in "Featured Manufacturers" on page 216. ■*



# Rewire your ESC

by Peter Vieira

Give your speedo a new lease on life!

**S**ome guys leave their ESCs' wires long so that they can swap the ESC from car to car and always have enough wire for the job. Other guys (like me) cut them short for best possible efficiency and a neat layout. Then, when it's time to install the ESC into another car, I have to splice more wire on or solder a jumper lead. After two or three installations, the wires look kinda hack and don't flex easily because they're saturated with solder. That's when I break down and install new power wires—easy to do if the ESC has solder posts, not so easy if the wires are soldered inside the unit. But then again, it's not so difficult either. Here's how to make your ESC look like new again.

## WARNING!

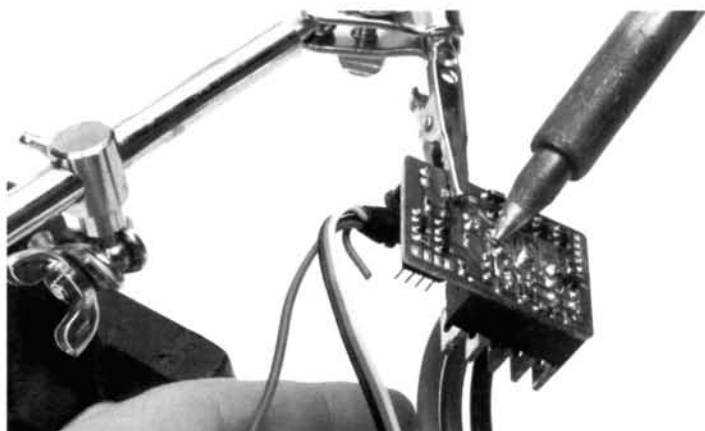
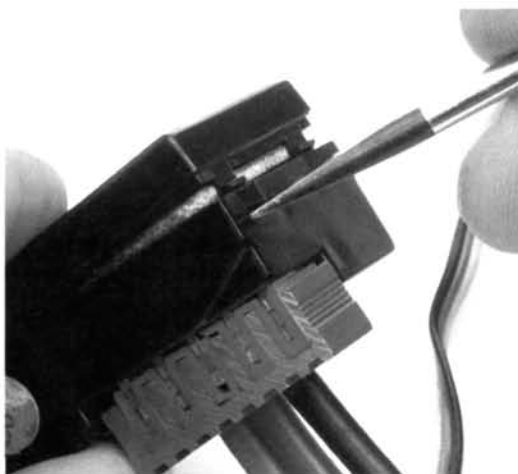
If your ESC is still under warranty, you are about to violate that warranty. So, if you goof up your ESC, don't go crying to the manufacturer—or to *Radio Control Car Action*, for that matter. If you aren't sure you can pull off this "how to," then you probably can't. On the other hand, if you have an ESC that's out of warranty, and you want to expand your "done that" list, fire up your soldering iron and go nuts.

## Step 1: Get ready for surgery

The power wires must pass through the case when you disassemble the ESC, so remove any connectors or splices before you begin. Remove clip-on heat sinks as well, if your ESC has them.

## Step 2: Open the case

Depending on your ESC's brand, you may have to remove some screws, peel off some tape, or release some clips (as this Hitec\* HFX required). Carefully remove the bottom of the case, then pull the circuit board from the top half of the case. You may have to gently tug the power wires to get them through the case. Clip the circuit board into the third hand.



## Step 3: Remove the power wires

Before you begin working on the circuit board, write down the order of the wires, or draw a diagram of their placement. You don't want to wonder later which wire is which. To remove the wires, heat the circuit board from the bottom where the wire passes through. Once the solder liquefies, tug the wire out. Repeat until all the power wires have been removed.

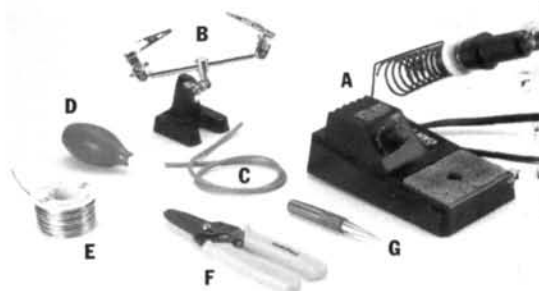
## YOU'LL NEED

### A. Soldering iron.

Use a good pencil-type iron, such as the Ungar\* Race Station pictured. Don't use a clumsy gun-type unit.

### B. Third hand.

RadioShack, Sears and just about any hardware store all offer these alligator-clip things. Don't try this job without one!



### C. Wire.

Trinity\*, Orion\*, GS Racing\*, Deans\* and others offer high-quality ESC hookup wire with flexible silicone insulation. Check your ESC's original wire and match its gauge, or upgrade to heavy-duty 12-gauge pipes.

### D. Desoldering tool.

Also good for basting tiny turkeys, this simple device will suck away liquid solder; I bought mine at RadioShack.

### E. Solder.

Use rosin-core 60/40 solder from RadioShack, or try Acer Racing's\* Super Solder, if you want to get fancy.

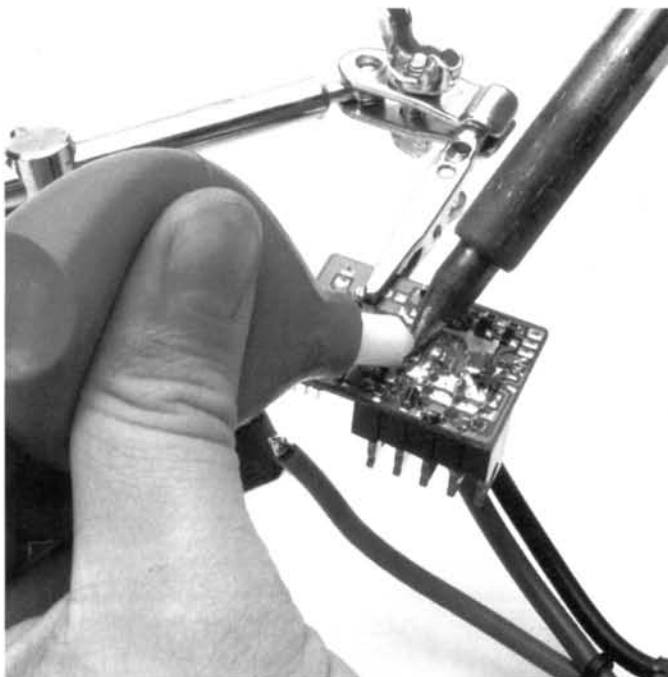
### F. Wire strippers.

Used to strip ... aww, you know.

### G. Reamer.

You may not need this tool, but keep it handy in case you need to open up the wire-mounting holes. A drill bit sized to match the new, uninsulated ESC wire will work, too.





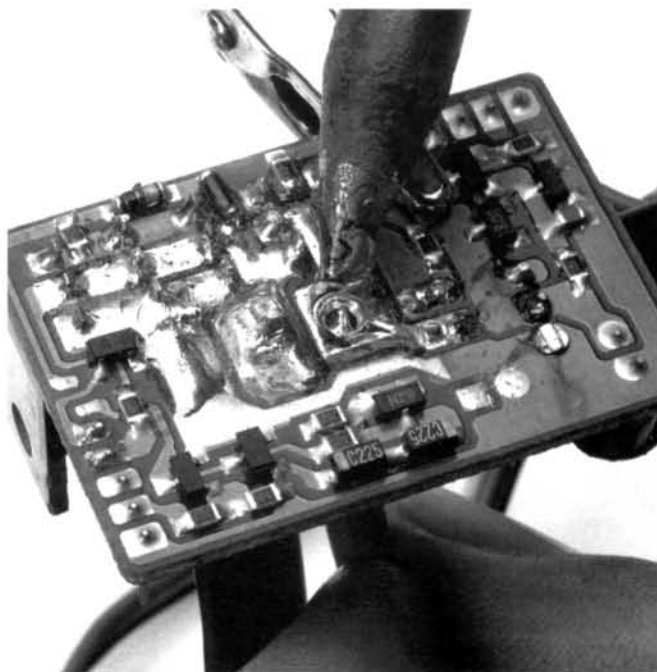
#### Step 4: Remove the excess solder

Use the desoldering bulb to suck away the solder blobs that fill in the holes for the wires. If you don't have a desoldering tool, you can gently open the holes with a drill bit or a reamer. If you're installing fatter than stock wires, you'll probably have to use the reamer or drill bit even if you have a desoldering tool.



#### Step 5: Tin the new wires

Strip  $\frac{1}{8}$  inch of insulation from each new wire, apply flux, then apply solder. Use just enough to saturate the exposed wire and no more. The wires won't fit into the holes properly if they have big blobs on them.



#### Step 6: Solder the new wires

Solder the wires in one at a time. Melt a bit of solder onto the tip of the iron. Hold the wire in place, and touch the tip of the iron to the wire/circuit-board joint. The solder should flow between the parts and complete the joint. Wait for the solder to solidify, then tug on the wire. If it feels solid, move on to the next wire. If you're having trouble, be patient and resist the urge to pile on more solder; you don't want to short any of the connections to the circuit board. Note: If you have a 4-wire, forward-only ESC, the battery and motor positive wires are probably soldered to the same spot on the board. If they are, you can convert your ESC to a 3-wire setup by simply leaving off one of the positive wires.



#### Step 7: Reassemble the ESC

Feed the power wires through the correct holes in the top half of the ESC case (you'll need to enlarge them with a reamer or a drill bit if you've installed heavier gauge wires), and attach the bottom half. Reinstall the heat sinks, and you're done.

*\*Addresses are listed alphabetically in "Featured Manufacturers" on page 216. ■*



# Pump it up

**N**ow stop and think about it for a moment: almost all types of engine have some sort of fuel-pumping system—except for our alcohol/nitro-powered model car engines. Why is that? I know I don't have the answer. I do know such pumping systems really help alcohol/nitro model airplane engines hold a steady needle-valve setting, thereby improving reliability, throttle response and even top end in some cases. Though airplane and car engines differ, the fundamentals of their operation are identical.

In the rest of the "piston-powered" world, carburetors commonly have fuel delivered to them by some sort of pumping device. Our nitro car engines, however, have been left out in the cold in this area. They literally have to suck the fuel in on their own from a remote storage area (the tank) through a length of flexible, small-diameter, silicone tubing. Even gasoline/ignition engines that power large-scale RC cars have carburetors with built-in, diaphragm-type fuel pumps. So what's the problem? The problem is that no manufacturer offered a fuel-pump system for our RC cars—until now.

Conley Precision Engines\*, known for its awesome 1/4-scale nitro-burning Viper V-10 and Chevy 327 V-8 engines, has now applied its tremendous experience with alcohol/nitro-powered model car engines to developing a fuel-pump system. Conley has recalibrated existing proven equipment for our high-rpm nitro car engines.

Just like those on full-scale cars, this system uses a diaphragm pump, but instead of being driven mechanically (as is the case with



full-scale car engines) it uses the pulsing of negative/positive crankcase pressure. Simply put, when negative pressure is applied, the diaphragm is sucked (pulled back) and fuel is drawn into the

**The 1-inch-diameter pump is 1 1/4 inches long, not including the pressure fitting and the chrome regulator adjustment screw. For lower fuel pressure, turn the regulator adjustment screw clockwise, and for higher pressure, turn it counter-**

**clockwise. The arrows molded into the black case's top indicate the fuel-flow direction through the fittings. The fitting on the left is incoming (from the tank) and the one on the right is outgoing (to the carburetor).**



**Below: the Conley carburetor comes with a high-rise intake manifold for more complete fuel atomization (when a liquid becomes a fine mist).**

**This is a preproduction prototype; the production manifold will be blue anodized.**



**HPI's beautiful new BMW GT-1 body allows access to everything.**

fuel pump. Conversely, when positive pressure is applied, the diaphragm is pushed outward, and fuel is pushed out of the pump and to the carburetor. Fuel pressure at the carburetor's spraybar is regulated by controlling the diaphragm's back-and-forth movement, or range, with an adjustment screw. A greater range of movement gives greater pressure, and a narrower range gives less pressure. Of course, the speed at which the diaphragm moves also affects pressure. The pressures are created by piston sweep, i.e., when the piston moves upward, a negative pressure is created, and when it moves downward, a positive pressure is created; the speed of the diaphragm's movement is directly proportional to rpm level. At high rpm, more fuel is delivered because of the diaphragm's faster movement and, of course, the



**Just to familiarize you guys with Conley Precision and their capabilities, take a look at this. It's a 1/4-scale 7.9-cubic inch, nitro-powered, running replica of a Viper V-10. It's exact scale right down to the Dodge part numbers and features spark-ignition and pressurized lubrication system. I'd say these guys know exactly what they're doing—wouldn't you?**



engine needs more fuel at high rpm. At low rpm, less fuel is delivered because the diaphragm moves less rapidly and less fuel is needed. This direct proportional relationship between rpm and fuel flow works out perfectly.

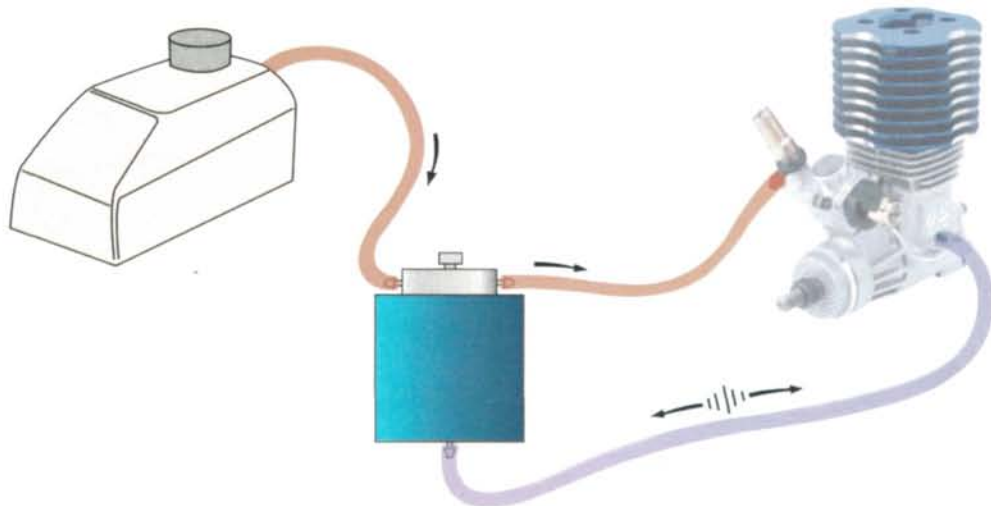
While full-scale/model comparisons can be made concerning the use of a diaphragm-type pump, there's a basic, and very significant, difference between their carburetors. The fuel pump in a full-scale car delivers fuel to the carb's float bowl; from there, it is passively drawn off and atomized in the intake venturi by means of, again, negative pressure, or suction. RC engine carburetors have no such float bowl, and the pump applies fuel pressure directly to the point of atomization—the spraybar orifice. This is a very important difference. When the pressure is delivered directly to the point of atomization, you have a form of fuel injection. When you combine Conley's pump system with the design of our RC carburetors, you end up with something

**With a pumped system, more atomized fuel charge reaches the combustion chamber, so the chamber's temperature tends to be lower, and this calls for a hotter plug than is usually used. So far, we have found that an Enya no. 4 plug from Altech Marketing\* works best.**



more like basic automotive throttle-body-type fuel injection instead of automotive-type carburetion. The first full-scale fuel-injection system was used on early Corvettes and, like in the Conley system, pump pressure was regulated by engine rpm. True, Conley's system has no electronic sensing like today's high-tech automotive fuel-injection systems, but neither did the Corvette's, and it boosted performance significantly.

The implications of now having a regulated, positive fuel pressure maintained at the spraybar with the type of carburetors we use on our RC engines are considerable. Moreover, the complete system, including carburetor, is available for a suggested price of only \$79.95. Obviously, further details



**The system is simple: the tube from the crankcase carries the positive and negative pressure pulses to the pump; these pulses push and pull the pump's diaphragm to move the fuel into and out of the pump. One-way check valves in the pump allows fuel to move in only one direction.**

on how the Conley system works with various types of engine and car setups deserves much more investigation. Steve Pond and I will be doing speed and acceleration tests with a variety of setups with

the Conley pump, both with and without the Conley carburetor. We suspect that certain brands of carb will work with Conley's pump.

I can tell you my initial tests with a stock HPI RS4 Super and the

subsequently added tuned pipe were very encouraging, to say the least. Both throttle response and needle-valve setting (mixture) stability were improved. It's my hope that mixture-stability benefits will help hard-to-adjust older engines that suffer from decreased fuel draw and run erratically. That, however, remains to be seen.

I would venture that a fuel-pump system might improve top-end speed, especially when used with a good tuned-exhaust system. Remember, with a 2-stroke engine, intake and exhaust happens as a single event over a very short time and within less than 360 degrees—a single turn—of crankshaft rotation. This means that whatever you do at one end—exhaust or intake—will affect the other end. If you stuff more, well-atomized fuel mixture into the intake end of your engine, performance will be best if you optimize things at the exhaust end, too, to help balance the engine's entire intake/exhaust breathing. That means combining the Conley system with a good tuned exhaust system will give the best overall performance.

Stay tuned for more on the Conley fuel-pump system. The fun has just begun. Steve and I are already arguing about which car/engine combinations will benefit most. Of course, I'm confident who you guys are betting on to be right; after all, I did teach Steve everything he knows—ha!

\*Addresses are listed alphabetically in "Featured Manufacturers" on page 216. ■



**The complete system mounted in an OFNA Z-10. On the carb body, note the graduated locator marks for the low-end mixture disc.**



**The complete system in OFNA's 1/8-scale Ultra GTLX off-road buggy. Note the crankcase pressure tap just behind the pull-starter handle. In non-pull-start engines, the pressure tap can be installed in the backplate; for a small fee, Conley will install it for you.**



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## The following manufacturers' products are featured in this issue.

**Ace Hobby Distributors Inc.,**  
 116 W. 19th St., Higginsville, MO  
 64037-0472; (660) 584-7121;  
 fax (660) 584-7766; www.acehobby.com.

**Acer Racing**  
 P.O. Box 5680, Santa Monica, CA  
 90409-5680; (310) 472-8090;  
 fax (310) 472-4870; www.acerracing.com.

**Airtronics**  
 1185 Stanford Ct., Anaheim, CA  
 92805; (714) 978-1895; fax (714)  
 978-1540; www.airtronics.net.

**Alien Racing Products**  
 Distributed by TJ Hobby  
 Distributors, New York, NY (800)  
 288-8185; (718) 863-3434;  
 fax (718) 863-4002.

**Altech Marketing**  
 P.O. Box 7182, Edison, NJ 08818-  
 7182; (732) 225-6144; fax (732)  
 225-0091; www.modelrec.com.

**Associated Electrics**  
 3585 Cadillac Ave., Costa Mesa, CA  
 92626-1403; (714) 850-9342; fax  
 (714) 850-1744; www.rc10.com;  
 www.teamassociated.com.

**Conley Precision Engines Inc.**  
 825 Duane St., Glen Ellyn, IL 60137;  
 (630) 858-3160.

**Deans**  
 See W.S. Deans Co.

**Dirt Works**  
 Distributed by Pro-Line.

**DuraTrax**  
 Distributed by Great Planes.

**Dynamite**  
 4105 Fieldstone Rd., Champaign, IL  
 61821; (217) 355-9511; fax (217)  
 352-0355; www.horizonhobby.com.

**Factory Team**  
 Distributed by Associated Electrics.

**Fantom Racing**  
 50201 Silver St., Vicksburg, MI  
 49097; (616) 649-9583;  
 fax (616) 649-9584.

**FMA Direct**  
 9607 Dr. Perry Rd. #109, Ijamsville,  
 MD 21754; (800) 343-2934;  
 fax (301) 831-8987;  
 www.fmadirect.com.

**Futaba**  
 Distributed exclusively by Great  
 Planes Model Distributors Co;  
 www.futaba-rc.com.

**Great Planes Model Distributors**  
 2904 Research Rd., P.O. Box 9021,  
 Champaign, IL 61826-9021; (800)  
 682-8948; fax (217) 398-0008.

**GS Racing**  
 650 W. Duarte Rd., Ste. 205,  
 Arcadia, CA 91007; (626) 445-6036;  
 fax (626) 445-6084;  
 www.gsweb.com.tw.

**GTP California**  
 18218 East McDermott, Ste. F,  
 Irvine, CA 92614; (949) 756-1219;  
 fax (949) 756-1227;  
 www.gtpcalif.com.

**Hammad Ghuman Inc.**  
 6 Tower Heights, Albany, NY 12211;  
 (518) 782-9255; fax (518) 782-9256;  
 www.ihg.com.

**Hitec RCD Inc.**  
 12115 Paine St., Poway, CA 92064;  
 (858) 748-6948; fax (858) 748-  
 1767; www.hitecrd.com.

**Horizon Hobby Inc.**  
 4105 Fieldstone Rd., Champaign, IL  
 61821; (217) 355-9511;  
 fax (217) 352-0355;  
 www.horizonhobby.com.

**HPI Racing**  
 15321 Barranca Pk., Irvine, CA  
 92618; (949) 753-1099; fax (949)  
 753-1098; www.hpiracing.com.

**Integy/Matrix Technology**  
 1140 Centre Dr. #E, City of Industry,  
 CA 91789; (909) 627-2713;  
 fax (909) 627-4132.

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# Chris's BACK LOT

The opinions expressed on this page do not necessarily represent the opinions of the entire *Car Action* staff. Any resemblance to reality is purely coincidental. Send your correspondence, hate mail, love letters, photographs—anything you like—to Chris's Back Lot, c/o *R/C Car Action*, 100 East Ridge, Ridgefield, CT 06877-4606. My email address is: [chrisc@airage.com](mailto:chrisc@airage.com).

BY CHRIS CHIANELLI

## Rumbling Revenge

**H**ow would you like to roll one of these heavy-metal monsters out onto your local off-road track after some wise-guy hammer has taken you out of a race early. "Go head, make my heat!"

The man behind these hand-crafted WW II RC panzer (tank) models is David Shultz. His motto: "I will make anything that somebody will pay for." Dave intends to offer these and other RC armored vehicles to the public on a limited-production basis. At the top is "Helmut," the 1/3-scale Jagdpanther—the tank that hunts other tanks. At bottom is "Heinrich," the 1/3-scale "D" Model Panther, and at the center of the page is the master craftsman himself with the 1/3-scale monsters and "Herman," the smaller 1/6-scale "E" Model Tiger tank. The 1/6-scale Tiger is powered by two 1/8hp, 12V DC gear motors, while the 1/3-scale giants are powered by, get this, an 11 1/2hp gasoline engine that drives a hydraulic double pump, which in turn powers two hydraulic motors via proportional hydraulic valves .... What do ya think of that? It's mechanized music to my ears.

The smaller Tiger is armed with a 3mm water cannon powered by a 12V, 3A pump. One can only guess what the "big boy" might

be armed with. The Tiger weighs in at 230 pounds, while its big brothers tip the scale at 1,400 pounds plus. Personally, I would ask Helmut to guard my Back Lot. Why? Because its got the biggest gun.

If you'd like more information on these aggressive creations, or on some new stuff Dave is working on, contact him at Merton Models, 2277 Woodglen Dr., Indianapolis, IN 46260; (317) 876-0742.

